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NORTH ATLANTIC DRAINAGE BASINS: A COOPERATIVE STATE-FEDERAL REPORT ON WATER POLLUTION

Public Health Service
New York, New York

1951

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For Clean Water—"One River, One Plan"

North Atlantic
DRAINAGE BASINS

A COOPERATIVE STATE-FEDERAL REPORT ON WATER POLLUTION

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Springfield VA 22151

FEDERAL SECURITY AGENCY

Public Health Service

137

SUMMARY REPORT ON WATER POLLUTION

North Atlantic Drainage Basins

Prepared by

FEDERAL SECURITY AGENCY
Public Health Service
Division of Water Pollution Control
North Atlantic Drainage Basins Office

1951

Details of illustrations in
this document may be better
studied on microfiche.

On the basis of information supplied by

Delaware Water Pollution Commission
District of Columbia Health Department
Maryland Water Pollution Control Commission
Massachusetts State Department of Health
New Jersey State Department of Health
New York State Department of Health:
Water Pollution Control Board
Pennsylvania Sanitary Water Board
Vermont State Water Conservation Board
Virginia State Water Control Board
West Virginia Water Commission
Atlantic States Marine Fisheries Commission
Interstate Commission on the Delaware River Basin
Interstate Commission on the Potomac River Basin
Interstate Sanitation Commission
New England Interstate Water Pollution Control Commission
The International Joint Commission

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INTRODUCTION

The Federal Water Pollution Control Act, Public Law 845, passed by the 80th Congress in June of 1948, requires the Surgeon General of the Public Health Service to cooperate with other Federal agencies, with State and interstate water pollution control agencies, and with municipalities and industries in the preparation or adoption of comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof, and improving the sanitary condition of surface and underground waters.

In developing these programs, due regard must be given to improvements necessary to conserve the Nation's waters for public water supplies, propagation of fish and aquatic life, recreational purposes, agricultural, industrial, and other legitimate uses.

Recognizing the fact that full technical information was not available to permit the development of such comprehensive programs immediately for most of the Nation's waters, the Public Health Service envisioned the development of these programs in two general phases. The first phase contemplated the development of a series of reports, consistent with presently available data, which would: provide a reference point for measuring progress; provide a guide to needed additional data; provide a basis for the logical development of comprehensive programs; provide a basis for approval of loans to States, interstate agencies and municipalities at such time as the Congress made available funds for this purpose; and serve to inform the public on the problem of water pollution and set forth suggestions for pollution control.

The collection of available data as of July 1, 1950, has been completed under the first phase of the program. Such data have been assembled with the cooperation of State and interstate water pollution control agencies. Through these agencies additional data have been obtained from other State officials, county and city officials and representatives of industry. Federal agencies also have been of great assistance. In order to make this information available at the earliest possible moment, these data are being presented in 15 summary-type reports covering the United States by major drainage basins. This report on the North Atlantic Drainage Basins is one of that series.

These summary reports present information about the ways our water resources are used, the pollution going into our water resources and the resulting damages, the benefits which may result from pollution prevention and abatement, the pollution prevention measures now in effect, and those required.

They are prepared in two parts. Part one considers the water pollution problems of the basins as a whole. Part two presents briefly the data for each of the several sub-basins of the major basins, including a list of projects now known to be needed for water pollution control.

Since the summary reports are based on data which are now readily available, these reports do not discuss or evaluate the most advantageous water uses as they are related to pollution control. Such considerations will be included as a part of the comprehensive water pollution control programs.

The deficiencies in data and the gaps in information indicated in these summary reports are as significant as the presentation of available facts and statistics. They indicate the work which still needs to be accomplished by water pollution control authorities for the preparation of comprehensive programs.

Data and knowledge now available are sufficient, however, to permit the immediate solution of many of the pollution problems within the North Atlantic Drainage Basins without awaiting the results of additional surveys and studies. The tabulations of pollution abatement projects which are included in Part Two of this summary report represent presently known needs. However, future studies and evaluations may result in some changes in the estimations of requirements.

A sincere effort has been made by all who contributed to this report to present a fair picture of the complex water pollution problems in the North Atlantic Drainage Basins and to present reasonable conclusions and recommendations. It is our hope that this report, as a step in the cooperative development of an ultimate comprehensive pollution control program, will help in safeguarding the water resources of the North Atlantic Drainage Basins.

Leonard A. Scheele

Surgeon General

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The Public Health Service wishes to express particular appreciation to the following agencies for supplying the information upon which this report is based, reviewing the preliminary draft, and submitting helpful comments:

Delaware Water Pollution Control Commission
District of Columbia Health Department
Maryland Water Pollution Control Commission
Massachusetts State Department of Health
New Jersey State Department of Health
New York State Department of Health:
  Water Pollution Control Board
Pennsylvania Sanitary Water Board
Vermont State Water Conservation Board
Virginia State Water Control Board
West Virginia Water Commission
Atlantic States Marine Fisheries Commission
Interstate Commission on the Delaware River Basin
Interstate Commission on the Potomac River Basin
Interstate Sanitation Commission
International Joint Commission
New England Interstate Water Pollution Control Commission

Federal agencies from which assistance was obtained include the Coast Guard, Treasury Department; Corps of Engineers, Department of the Army; Community Facilities Service, Housing and Home Finance Agency; Fish and Wildlife Service and Geological Survey, Department of the Interior; Bureau of Census, Department of Commerce; Soil Conservation Service, Department of Agriculture, and the Supervisor of New York Harbor.

Finally, there is acknowledged the assistance of other State and Federal agencies and individuals interested in water resources development and conservation, that have contributed information through other sources than those listed above.

SUMMARY

The North Atlantic Drainage Basins, as defined for this report, include the Hudson River drainage area, the Delaware, the Susquehanna, the Potomac, Upper Chesapeake Bay to the southern boundary of Maryland, and the many small coastal streams in New York, New Jersey, Delaware, and Maryland. Included also is that portion of the Great Lakes - St. Lawrence Drainage Basin which lies in New York, exclusive of the Lake Champlain drainage.

This area covers very small parts of Vermont and Massachusetts, most of New York State, the eastern two-thirds of Pennsylvania, all of Delaware and New Jersey, practically all of Maryland, the District of Columbia, the northern part of Virginia, and eastern West Virginia. It extends 510 miles from the northern boundary of New York to the mouth of the Potomac, and 440 miles from the western headwaters of the Potomac to the eastern tip of Long Island.

The North Atlantic Drainage Basins have been a key area of our Nation from the earliest days of its history--the core of the Nation's industrial and economic wealth. In an area of 103,000 square miles, or only 3.4 percent of the United States, reside over 30 million--more than 20 percent of the Nation's population.

This area abounds in natural resources--the mineral deposits of Pennsylvania, the fisheries of the Chesapeake Bay and the Atlantic Coast, and the rich agricultural lands of New York, New Jersey, Pennsylvania, Delaware, Maryland, and Virginia. Approximately 10 to 15 percent of all coastal fishing activity in the United States is found in this region. More than 5 percent of the crop income and nearly 10 percent of the livestock income accrues in this comparatively small land area. Nearly 60 percent of the Nation's import trade and about 25 percent of its export trade move through the ports of New York, Delaware River, and Baltimore. About 32 percent of all United States industry is located here, employing more than 25 percent of the workers and producing nearly 27 percent of the value added to manufactures. Similarly nearly one-quarter of all business activity and total employment of the Nation is found within this area. The retail trade of the New York Metropolitan Area alone amounts to nearly 11 percent, and the wholesale trade more than 22 percent, of the United States total, in an area of only about 0.1 percent of the country.

The large population and intensive industrialization places an unusually heavy burden on the water resources of the North Atlantic Drainage Basins. The total water consumption from surface supplies, the principal sources in this area, is estimated at more than 20 billion gallons per day. Of this volume about 17 billion gallons per day are used for industrial purposes and the remainder for municipal demands.

Waste discharges are roughly equal to the tremendous water consumption. Municipal sewer systems discharge wastes from a tributary population of over 23 million. Although data are lacking, it is estimated that the industrial contribution is at least equal in strength to the domestic flow of wastes. Approximately 1,400 municipalities and institutions are actual or potential sources of pollution, with one-third now satisfactorily treating their waste discharges. Almost 1,800 independent industrial waste discharges are recorded. This figure is admittedly incomplete. Several hundred industries in metropolitan areas are not included. In addition there are probably a thousand bituminous and anthracite coal operations, many abandoned, discharging acid wastes. The industrial pollutants include acids, alkalies, oils, phenolic substances, dyes, toxic materials, pulp and paper wastes, metals, cannery wastes, dairy products, coal and silt.

As might be expected, the tremendous pollution load discharged to the streams of this region has caused considerable damage in several areas. Industrial wastes and domestic sewage in the Delaware at Philadelphia and below, and on the Niagara River, have seriously limited the uses of these waters. Pollution contributed to the waters of the New York Metropolitan Area have been conservatively estimated to have caused damages to fisheries, recreational assets and real estate values amounting to $100,000,000 over a 20-year period. On many streams of the North Atlantic Drainage Basins the recreational values have been severely limited by pollution, an outstanding example being the Potomac River at Washington, D.C. Acid mine drainage has seriously affected the waters of the North Branch of the Potomac and several branches of the Delaware and Susquehanna Rivers. Soil erosion has been particularly damaging to the Monocacy River and Goose Creek in the Potomac Basin, and silt and culm on the Schuylkill River.

Where pollution abatement has been instituted both tangible and intangible benefits have accrued. The potential health hazard from domestic sewage has been reduced. Water treatment plants have been able to produce a safer and more palatable product. Streams have been reclaimed from industrial pollutants and are again supporting aquatic life. Considerable economic gain has resulted where industrial plants have reclaimed materials which formerly were wasted into streams.

Pollution abatement facilities needed by municipalities in the North Atlantic Drainage Basins are tremendous, since only 60 percent of the more than 1,400 municipal sewer systems are provided with treatment works. Nearly seven million people are served by facilities considered adequate for the present. About one-third of the municipalities, with a tributary population of over nine million, need new treatment works, and enlargements or replacements are needed to properly serve about eight million people. The biggest task is to provide facilities where none now exist. In many cases this will involve construction of intercepting sewers which may cost as much as the treatment plants. A summary of municipal treatment facilities by sub-basin is given in the following table.

Progress in pollution abatement was very slow in the immediate postwar period due to many factors. However, by 1949, postwar construction accounted for the completion of 63 municipal plants serving more than 893,000 people. Projects now under construction will serve approximately six million people, of which 3.26 million will be served by new plants, the remainder by enlargements or additions to existing plants. A considerable spurt in the numbers of treatment works is also anticipated due largely to the construction orders issued by the Sanitary Water Board in Pennsylvania.

Over one-third of the industries listed have treatment facilities, of which more than one-half are satisfactory with respect to capacity and operation. Progress in industrial pollution abatement is seen in the construction of 127 waste treatment plants in the past four years, with many more to follow in the next few years. Considerable activity in industrial pollution abatement is evidenced by the fact that 426 industries have corrected former pollution. However, this is not more than 24 percent of the total number of sources reported. When all of the existing sources of industrial waste pollution become known, this percentage will probably be reduced. The most encouraging aspect is better cooperation shown by industries.

Water pollution control legislation has been strengthened since 1945 in the States of Pennsylvania, Virginia, Maryland, Delaware, New York, and Vermont. Pollution control laws are regarded as reasonably adequate, but further improvement is desirable, particularly as regards uniformity. Of greatest need is the comprehensive review of municipal financing provisions as they relate to sewerage construction.

All the States are carrying out aggressive programs. In addition to these State activities, there are five interstate agencies which have primary interests in pollution problems in the

Status of municipal pollution abatement--North Atlantic Drainage Basins

Name of Sub-basin	Municipal sources of pollution			Population		
	Total number	Percent with treatment	Percent with adequate treatment	Total served by sewers	Percent of sewered population served by treatment	Percent of sewered population served by adequate treatment
Great Lakes - St. Lawrence..........	178	60	33	1,995,579	89	12
Hudson River............	150	62	39	1,074,745	55	24
New Jersey - New York Metropolitan Area and Long Island...........	240	84	53	11,874,599	55	37
New Jersey Coast........	53	100	87	250,160	100	84
Delaware River..........	315	61	37	3,716,700	44	12
Susquehanna River.......	285	33	15	1,670,515	30	12
Upper Chesapeake........	71	63	41	1,034,343	95	89
Potomac River...........	136	64	34	1,596,939	87	14
North Atlantic Drainage Basins.......	1,428	61	37	23,213,580	60	30

North Atlantic Drainage Basins, and the International Joint Commission which is concerned with the international aspects of pollution in the Great Lakes - St. Lawrence River area. In addition to the programs of the State and Interstate agencies and the International Joint Commission, the operations of the Corps of Engineers, the Coast Guard, and harbor authorities aid in preventing and controlling oil pollution.

Invaluable support has developed through many local conservation groups interested in pollution abatement, the outstanding example of which is the Brandywine Valley Association. Local chapters of sportsmen's groups have likewise been very helpful in promoting educational campaigns and supporting abatement programs.

State water pollution control agencies have under orders to abate pollution 221 municipalities and 243 industries. There are 35 municipal and 43 industrial pollution abatement projects now under construction. These municipal projects will reduce by 3.26 million people, the nearly 9.5 million not now served by any treatment works. These include the tremendous undertakings of New York City, Philadelphia, and Washington, D.C. The final plans of 225 municipal and 56 industrial projects have been approved and it is hoped a substantial number will shortly be under construction. A summary of municipal project requirements and project status, by sub-basins, is given in the following table.

The physical needs as reviewed in the foregoing cannot represent the total requirements needed to abate pollution. Technical knowledge is inadequate to cope with some problems such as acid mine drainage. Some industrial wastes need further study to develop practical treatment methods. More economical methods of municipal waste treatment are needed. The problem of financing abatement works is vexing in many cases. All water pollution control agencies need additional personnel in order to expedite programs. This is particularly true in New York State. Control programs and construction programs must be accelerated if the ground gained is to be held and the backlog overtaken.

It will cost an estimated minimum of $1 billion to complete the needed municipal and industrial pollution abatement works. When all of the information becomes available on the water pollution control problem, and in view of possible increasing construction costs, this estimated cost may approach $2 billion. Annual operation and maintenance charges must be added to complete the picture.

Summary of municipal project requirements and project status--North Atlantic Drainage Basins

Name of Sub-basin	Project requirements			Project status				Under construction	
	Number of projects required	Population to be served by projects required	Percent of total sewered population represented in requirements	Undetermined or no formal action	Abatement ordered	Plans in preparation	Final plans approved	Projects in percent of total required	Population to be served percent of total population requiring projects
Great Lakes - St. Lawrence......	118	1,714,486	85.9	68	0	11	40	1.7	0.1
Hudson River........	87	834,170	77.6	47	0	9	31	0.0	0.0
New Jersey - New York Metropolitan Area and Long Island............	117	7,914,339	66.6	25	12	17	23	12.0	31.6
New Jersey Coast....	10	36,035	14.4	3	7	1	0	0.0	0.0
Delaware River......	159	3,273,931	88.0	76	71	24	41	10.0	63.9
Susquehanna River...	141	1,225,855	73.3	110	124	30	75	1.4	0.7
Upper Chesapeake....	30	903,883	87.4	23	2	3	3	3.3	95.1
Potomac River.......	62	1,382,273	86.5	40	5	13	12	1.6	68.7
North Atlantic Drainage Basins...	724	17,284,972	74.4	392	221	108	225	4.7	33.6

CONCLUSIONS

1. Current municipal pollution abatement progress is highly gratifying in metropolitan areas where projects under construction will serve nearly 6 million people--over 25 percent of the entire sewered population of the North Atlantic Drainage Basins. Completion of these projects will reduce by 3.26 million the 9.5 million people not now served by treatment works.

2. Current pollution abatement progress in non-metropolitan areas is insufficient to overtake the current backlog in a reasonable period of time. At the present rate of construction 25 years will elapse before the needed projects are completed, and during this time many more needs will develop involving modification of existing facilities.

3. The current trend in industrial waste treatment and process recovery is encouraging. Incomplete data and interrelation of the problems involved, since considerable industrial waste pollution abatement hinges upon the completion of municipal facilities, make it impossible to determine the relative status of municipal and industrial waste pollution abatement.

4. Information concerning most of the principal sources of pollution from both domestic and industrial origin, while admittedly incomplete, is sufficient to determine at least the minimum corrective measures needed. Accomplishment of these minimum requirements, final plans for many of which have been prepared, will very substantially reduce existing pollution.

5. Further investigation of most watercourses is needed to provide more complete information on sources and effects of pollution, stream water quality, and desirable water uses. However, construction of most treatment works need not await such further investigation, since sufficient data are available to determine at least minimum requirements.

6. Acid mine drainage from the coal fields causes pollution problems of sufficient magnitude and unique character to warrant placing special emphasis on studies looking toward their solution.

7. In many of the streams excessive silt loads caused by soil erosion is a damaging form of pollution, which destroys aquatic life, increases water treatment costs, clogs navigation channels, creates flood hazards, and impairs the ability of streams to recover from organic pollution in addition to economic loss suffered by farmers through loss of valuable irreplaceable top soil.

8. Financing the construction, operation and maintenance of pollution control projects is a major problem in most areas, often complicated by legal inflexibilities.

9. Public information programs are an important item in water pollution control and may be more completely utilized in developing public acceptance of water pollution control programs.

10. The need for ever increasing quantities of high quality water to satisfy domestic and industrial requirements necessitates continued pollution abatement efforts without relaxation.

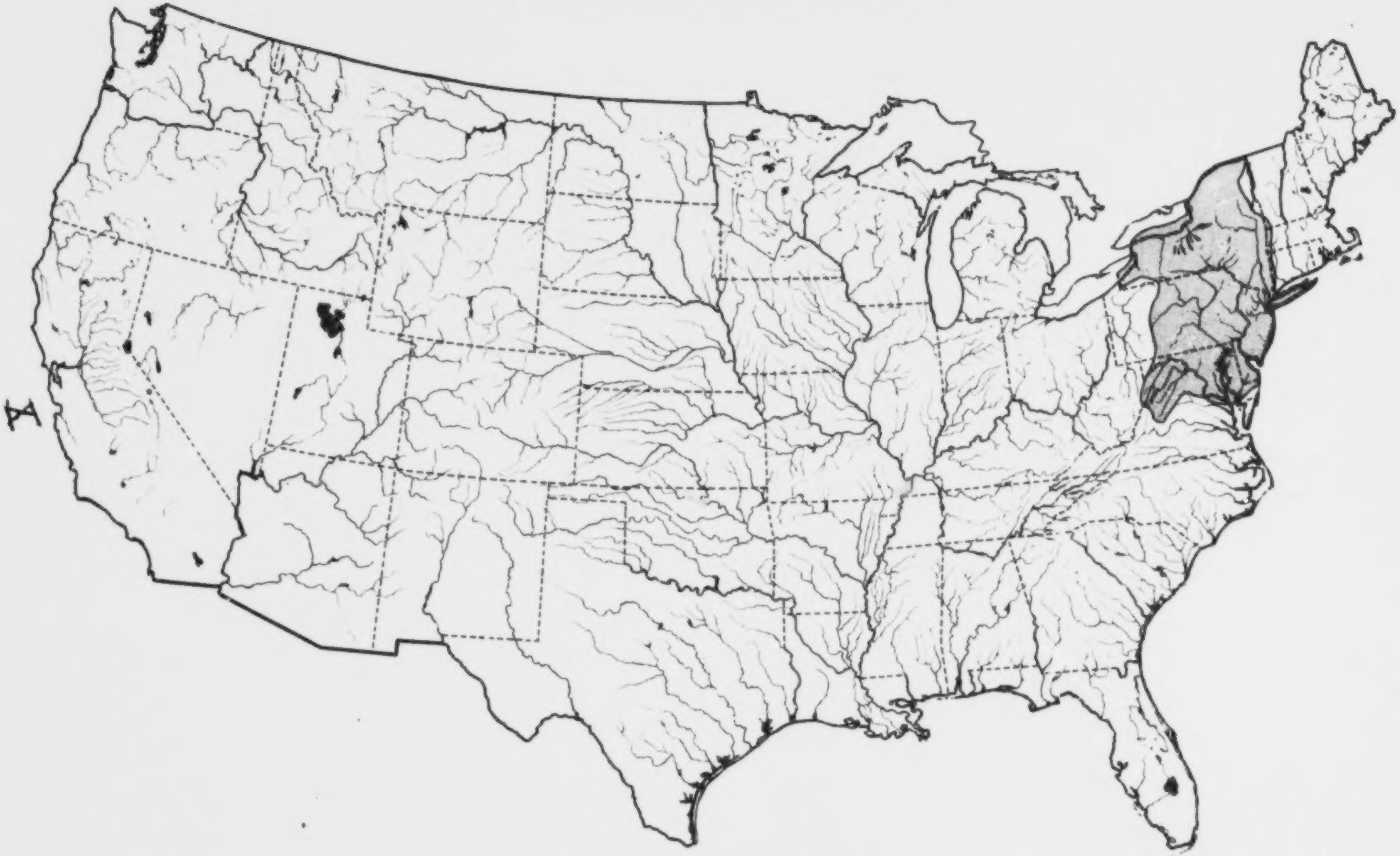
RECOMMENDATIONS

It is recommended that:

1. Water pollution abatement be accelerated.
2. The municipalities, Federal and State institutions, industries, and others responsible for pollution take positive action in accordance with the policies of the respective State and Interstate water pollution control agencies, to provide for pollution abatement.
3. The water pollution control agencies undertake investigations to provide the additional information necessary for the furtherance of comprehensive programs for the control of water pollution.
4. Industries intensify present efforts and develop new approaches toward practical solutions for presently unsolved industrial waste pollution problems, such as acid mine drainage and other industrial waste problems encountered by the respective State and Interstate water pollution control agencies.
5. Land management improvement programs be supported vigorously to reduce the silt loads now reaching the streams.
6. State and local governments stimulate detailed and comprehensive studies of municipal water pollution abatement financing methods.
7. Public information programs regarding water pollution control be continued and expanded through every available means.

LOCATION MAP

North Atlantic Drainage Basins



GENERAL DESCRIPTION

Historical Background

The great river-estuaries of the North Atlantic Drainage Basins were first explored, in recorded history, in the early 16th century. Within thirty years of Columbus' first voyage the Florentine explorer, Giovanni da Verranzano, in the employ of Francis I of France, voyaged along the coast of North America and entered and described the bays and river mouths of the Chesapeake, Delaware, and Hudson. Eighty-five years later the distinguished English sea captain Henry Hudson, employed by the Dutch East India Company to find the Northwest Passage to the Indies, returned to these shores seeking the elusive water route to the East, After sailing southward as far as Virginia and making a short stop at the mouth of the Delaware, Hudson entered the great river which now bears his name. The size of the river and its depth led him many leagues upstream before he realized that it was not the much sought Northwest passage.

In April 1624 colonists, under the sponsorship of the Dutch West India Company, set sail for the new continent. These first settlers established settlements in the lower Hudson in the region where Albany now stands, along the Connecticut shore, and on the big river to the south--the Delaware. The wave of colonization of the New World was now in full tide. The Dutch, Swedes, Finns along the lower Delaware, the English and Germans, in the great colony of William Penn's, the English along the shores of the Chesapeake, and the Dutch in North Jersey.

As a result of several European wars and the settlements between Kings, this area soon became completely under the jurisdiction of the English crown. By 1774 the colonies were ripe for revolution and Philadelphia was the capital of the first Continental Congress. More actual war was seen in the valley of the Delaware and across New Jersey than in any other region. With the coming of peace and the establishment of a new Nation, its capital was found in the cities of this area, New York, Philadelphia, and finally on the banks of the Potomac.

The waterways of this new land were for a very long period the only satisfactory means of communication, particularly for the movement of goods and products. They also provided a bountiful source of food in the fin and shellfish which appeared to be present in almost unlimited abundance. While natural waterways sufficed for light Indian trade, improved waterways were needed for the heavier and bulkier commodities of the white civilization. The demands for canals were frequently heard. As early as 1724 a canal connecting the Great Lakes with the Hudson received official cognizance from the New York authorities.

Following the American Revolution, the era of canal building swept over the Nation with far reaching effects. The Erie Canal was completed by 1825, one of the largest engineering works constructed by any government in the world up to that time. The Chesapeake and Ohio Canal, from the Nation's Capital to the coal fields of the Cumberland region, was another of the great canal ventures. Throughout this region many rivers were interconnected with short canals, or the rivers themselves improved for navigation. The Delaware and Raritan Canal, the Delaware and Hudson Canal, Lackawaxen Canal, Lehigh Canal, Schuylkill Canal, Chesapeake and Delaware Canal, and many others appeared. With the facilities for handling bulk cargo and the valuable mineral resources of Pennsylvania conveniently located to these waterways, the area at a very early period became the industrial center of the growing Nation. The coming of the railroads has caused the abandonment of many of these canals, but others still serve as arteries of commerce, particularly in the movement of bulk commodities such as fuels and grains.

Physical Description

The North Atlantic Drainage Basins, as defined for this report, include the Hudson River drainage area, the Delaware, the Susquehanna, the Potomac, Upper Chesapeake Bay to the southern boundary of Maryland, and the many small coastal streams in New York, New Jersey, Delaware, and Maryland. Included also is that portion of the Great Lakes - St. Lawrence Drainage Basin which lies in New York, exclusive of the Lake Champlain drainage.

This area covers very small parts of Vermont and Massachusetts, most of New York State, the eastern two-thirds of Pennsylvania, all of Delaware and New Jersey, practically all of Maryland, the District of Columbia, the northern part of Virginia, and eastern West Virginia. It extends 510 miles from the northern boundary of New York to the mouth of the Potomac, and 440 miles from the western headwaters of the Potomac to the eastern tip of Long Island.

There are four main rivers in this region. The Hudson River drains an area of 13,000 square miles and flows a distance of about 270 miles from its headwaters at an elevation of 4,293 feet to the sea. The Delaware drains some 12,750 square miles and flows 326 miles to the sea. The Susquehanna, the largest river on the eastern seaboard, drains 27,400 square miles, and flows 544 miles from its headwaters to the head of the Chesapeake Bay. From the headwaters of the South Branch of the Potomac to tidewater, the Potomac flows 282 miles. The tidal section from Washington to Chesapeake Bay stretches another 117 miles. The total drainage area of the Potomac is 14,700 square miles, of which the Shenandoah, its largest tributary, drains 3,054 square miles.

These rivers all flow through the Appalachian Mountains or rise on its slopes. The headwaters lie in rugged mountainous terrain covered with heavy forest growths. Some streams like the Shenandoah drop rapidly to a relatively broad fertile valley, lying between sharp ridges, where the stream meanders until reaching the Potomac. Others, such as the Delaware, flow through narrow gorges, until breaking through the last of the mountain barriers, meet tidewater. The Hudson, until reaching tidewater at Troy, N. Y., is a relatively small rapidly flowing mountain stream. From Troy to the sea it is a broad, straight and deep estuary flowing between sharply rising banks.

The terrain of the North Atlantic Drainage Basins is markedly varied. There is the low, flat coastal plain of New Jersey and Delaware, the rows of parallel ridges of the Watchung, Kittatinny, Blue Ridge, Shenandoah, Blue, Tuscarora, Tussey, and Allegheny Mountains, with intervening fertile valleys. There are the rounded peaks of the Catskills and the more massive uplift of the Adirondacks with the highest point in the area, Mt. Marcy (5,344 feet), and finally the sparsely settled, densely wooded area, with many lakes, of northern New York, and the rolling tableland of central and western New York.

The climate of the North Atlantic Drainage Basins can be described under two headings, oceanic and continental. Neither, however, goes to extremes. The former is found throughout the coastal areas of New York, New Jersey, Delaware, and Maryland, and is characterized by humid summers, evenly spaced precipitation and a growing season of about 200 days per year. The precipitation in this coastal area averages from 40-48 inches per year and the average annual temperature ranges from 48^0F to 57^0F. In any season, the coastal regions rarely have extreme temperatures in any one day.

Moving inland there is a change to the continental type of climate where extremes of temperature are encountered in a single day. Precipitation tends to be lower, except in the mountains. The average winter and summer temperature is lower and higher respectively than in the coastal area. The trend of the mountain ridges at right angles to the normal storm path tends to modify the local climatic conditions from the overall average, particularly precipitation. In general throughout the area, the major portion of the precipitation occurs in the warm season which is very advantageous for agriculture. The mountainous areas tend to have a heavier winter precipitation than the lowlands, and the lands bordering on Lake Erie and Lake Ontario have a modified continental climate due to the proximity of the large bodies of water.

In the summer thunder storms are characteristic of this area and are responsible for the flash floods that occur in the shallow streams flowing in deep narrow valleys. The major floods of this region usually occur in the spring when the streams are high from the spring runoff and a storm of tropical origin moves in from the sea dropping its moisture load on an area already saturated.

Economic Development

With the unsurpassed harbors and ports at New York, Philadelphia and Baltimore, the North Atlantic Drainage Basins were from the beginning of their development the principal economic key of the Nation. Through these cities funneled the great tides of immigration in the 19th century. Although many of the immigrants moved on to the free lands in the west, a good number settled in these ports of debarkation. By 1835, through the stimulus of immigration and the opening of the Erie Canal, New York had become the largest and wealthiest city of the country, a position it has maintained to this day.

According to the preliminary figures of the 1950 Census, the population of the North Atlantic Drainage Basins is 30,416,000, or 20 percent of the United states total. This population total is based on the county boundaries most nearly approximating the Basins boundaries in those States not entirely in the Basins area.

To determine the population distribution within this region it is necessary to refer to the more complete figures of the 1940 Census. For this purpose, the States of New York, New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia were taken as the approximate Basins. In 1940 this area had 76 percent of its population in urban communities, nearly 7 percent on farms and 17 percent as the rural non-farm population. The distribution of population density can be gained from the following tabulation:

	Population per square mile
United States	44.2
New York	281.2
New Jersey	553.1
Pennsylvania	219.8
Delaware	134.7
Maryland	184.2
District of Columbia	10,870.3

The natural resources in the North Atlantic Drainage Basins come from its soils, from beneath the earth and from its waters, both fresh and marine. In the fertile valleys between the ridges along the Shenandoah and in the rolling upland of southeastern Pennsylvania and in Pennsylvania Dutch country in the drainage of the Susquehanna, are found some of the richest agricultural lands in the country. The friable sandy soils of New Jersey have earned it the title of Garden State, and its tremendous truck farms help feed the New York and Philadelphia metropolitan areas. The Finger Lake region of New York and the lands bordering on the Great Lakes are famous as a dairying country, and for their orchards and vineyards. Of all the farms in the United States, 6.7 percent are found within the borders of this region, but comprise only 3.5 percent of the farm acreage of the country. In value, they represent 6.1 percent of the farms of the United States. The farms of this area have an average value of $7,075, as compared with the United States average of $7,917. The cash receipts in crops represents 5.6 percent of the United States total, in livestock 9.7 percent and in Government payments 12.5 percent.[1]

The fisheries of the North Atlantic Drainage Basins come chiefly from the coastal areas of New York, New Jersey, and Delaware, and the Chesapeake Bay area of Maryland. Of all the fisheries in the United States, 13.3 percent are operated in these States, with 9.0 percent of the fishing vessels and 16.0 percent of the fishing boats. In 1945 they caught 11.9 percent of the total United States catch, with a value to the fishermen of 12.0 percent of the United States total. Of particular importance to problems of pollution is the shellfishery of the country. In this region, 13.3 percent of the total United States shellfish production was harvested, worth 21.2 percent of the total value.[2]

The mineral resources of the North Atlantic Drainage Basins help set the pattern of industrialization with which this area has paced the country. The early settlers developed the bog iron deposits in the New Jersey coastal swamps, in addition to iron mines in the Northwestern hill country of this State. Zinc and copper were other mineral resources of New Jersey that were used by the early industrialists. But it was not until the bituminous and anthracite coal deposits of Pennsylvania, and the bituminous coal areas of Western Maryland were discovered, that mineral exploitation really developed. In 1947, twelve counties in Pennsylvania, one in Maryland, and two counties in West Virginia, that are in this drainage region, produced 29.9 percent of the bituminous production of the United States. Twelve counties of Pennsylvania, all in this drainage area, produced practically the entire anthracite production of the United States, with a value in 1948 of more than $467,000,000. Zinc production in New York and New Jersey still amounts to 15.2 percent of the United States production. Iron ore is also produced in New York, New Jersey, and Pennsylvania, but not in the volume of the Minnesota and Michigan deposits. However, the high grade of magnetite ores mined in Pennsylvania are valuable in beneficiating low grade ore.[3]

As indicated by the 1947 Census of Manufactures, 32 percent of all industrial establishments are in the North Atlantic Drainage Basins, with 25.9 percent of the production workers and producing 26.6 percent of the value added to manufactures. Of those industries which use large volumes of water and are potential contributors to pollution, from 19.0 percent to 50.4 percent of the establishments of these industries are located here.

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[1] 1945 Census of Agriculture (Department of Commerce) - Data analyzed for the entire States of New York, New Jersey, Pennsylvania, Delaware and Maryland.

[2] Fishery Statistics - 1945 (Statistical Digest No. 18, Fish and Wildlife Service, Department of the Interior, 1949) - Data summarized for the States of New York, New Jersey, Delaware and Maryland.

[3] Minerals Year Book (1947), Bureau of Mines, Department of the Interior.

They employ approximately one-quarter of the total United States production workers in the specific industries and have a value added ranging from 16.8 percent to 34.4 percent of the Nation's total. The detailed breakdown of these industries is given in the following table:

Economic Summary

Manufacturing*	Per cent of U.S. total		
	Establishments	Production workers	Value added
Food and kindred products	19.0	21.2	22.6
Textile products	50.4	24.3	27.1
Lumber and lumber products	9.8	6.5	6.4
Paper and allied products	38.6	27.6	26.4
Chemicals and allied products	29.5	34.4	34.4
Petroleum and coal products	21.4	21.8	22.3
Rubber products	25.9	16.4	18.2
Leather and leather products	47.9	30.6	32.4
Primary metals	20.4	17.3	16.8
All manufacturing	31.9	25.9	26.6

*Data from 1947 Census of Manufactures. Data assembled for the entire States of New York, New Jersey, Delaware, Maryland, and the District of Columbia; Pennsylvania minus the Pittsburgh, Erie, and Youngstown metropolitan areas; 15 counties in Virginia, and 8 counties in West Virginia. For the latter two, all data but number of establishments were calculated as a percent of State total based on the percent of the establishments in the counties in the Basin for each State.

The business activity of the North Atlantic Drainage Basins is also approximately one-quarter of the Nation's total. It has 23.7 percent of the retail trade establishments, 26.7 percent of the wholesale trade establishments, 25.6 percent of selected service trades, and 17.2 percent of hotels. The sales for these activities range from 17.0 percent to 30.4 percent of the United States total.

Employment in the first quarter of 1948 in the North Atlantic Drainage Basins (calculated to the nearest county boundary) showed the following percentages of the United States total:

Agriculture, forestry, fishing	13.6
Mining	14.1
Construction	20.1
Manufacturing	26.3
Public utilities	26.8
Wholesale trade	25.6
Finance, insurance, real estate	33.9
Services	25.1
Retail trade	22.2

As with the other economic indices approximately one-quarter of the employment in the Nation is found in this area.

With three of the major ports of the country within the Basins boundaries, waterborne commerce is a major activity in this region. Tonnage figures based on the waterborne commerce, inland, coastal, and foreign, that moved through the ports of New York, Delaware River, and Baltimore in 1948 showed that 29.0 percent of the United States total, 59.1 percent of the United States import trade and 22.5 percent of the United States export trade was handled in these ports.

USES OF WATER RESOURCES

Within the North Atlantic Drainage Basins, the principal use of water resources are for municipal and industrial water supply. Although there is extensive usage of ground water supplies for these purposes throughout the area such as in Long Island, Central and South Jersey, and the Chesapeake Bay area of Maryland, the highly urbanized regions of New York, Philadelphia, Baltimore, and Washington depend almost entirely on surface waters for their water supplies. Throughout central and western New York and the Susquehanna drainage area, surface waters are the sources of water supply for the larger municipalities whereas the smaller communities tend to find their water in wells and springs.

Municipal water consumption in this region amounts to over 2,690 m.g.d. from surface water supplies. Industrial usage can only be roughly estimated, but may be as great as seven times this amount.

The problem of water supply has become very acute for the large urban areas. With demand continually rising, all the larger cities have been hard pressed in recent years to keep their supplies up to adequate volumes. The four above mentioned areas now have programs in progress to meet current and anticipated drains on their municipal water supplies. The Interstate Commission on the Delaware River Basin has recently proposed a program of reservoir development on the Upper Delaware River and its branches which would provide water to both the New York and Philadelphia metropolitan areas, as well as to other areas in Pennsylvania and New Jersey, supplementing existing supplies and providing for all foreseeable future demands. The Corps of Engineers has under study flood control and navigation plans which provide for incidental water supply and pollution abatement.

Development of the highly industrialized sections of the North Atlantic Drainage Basins has been in part due to the availability of adequate volumes of water for industrial purposes. The industrial demands on water supply have in recent years become so great that future expansion may be limited unless adequate supplies can be provided and existing supplies protected from damaging pollution.

Navigation continues to be one of the prime functions of the waterways of this area, particularly on the Hudson and Delaware Rivers and Chesapeake Bay. The New York State Barge Canal, the modern version of the old Erie Canal, carries a large volume of shipping via the canalized Mohawk River and canal links to the Great Lakes.

Commercial and game fishing along the coastal areas of this region and in the Chesapeake Bay are important users of the marine water resources. The upland waters support a considerable game fishing activity in addition to commercial fishing on the larger fresh water lakes of New York and the Great Lakes bordering on this region.

Some of the finest recreational areas of the country make use of the water resources of the North Atlantic Drainage Basins. The streams and lakes of the Catskills, Adirondacks, Poconos, and the Ramapo Mountains, the shores of Lake Erie and Lake Ontario, the Finger Lakes of New York, the waters of the Chesapeake Bay, are visited by thousands of vacationists each year. The famed beaches of New Jersey and Long Island are used by millions each summer weekend. The coastal areas of this region with its many bays and sounds provide protected boating waters for myriads of small vessels. An indication of the numbers of boats involved can be drawn from the registry lists of the Coast Guard. Non-commercial, machine - propelled vessels over 16 ft. in length, as registered in the New York Philadelphia, and Baltimore Districts, numbered over 91,000 in the first quarter of 1950. This was an increase of about 11 percent over the first quarter of 1947. This number does not include, of course, the untold numbers of smaller vessels and larger vessels which are not machine - powered, or those operating on inland waters.

The great falls of the Niagara River, a world renowned spectacle, are not only a tremendous recreational asset but provide hydroelectric power for the industry of the Buffalo area. Hydroelectric power is developed by many industrial users in northern New York and by public utilities on the Hudson River. On the lower Susquehanna River there are extensive hydroelectric plants at Safe Harbor, Holtwood, and Conowingo. The Conowingo plant, when built in the early twenties, was the largest of its type in the country. It supplies power to both Philadelphia and Baltimore.

Surface water supplies, where adequately developed, have in general been sufficient in quantity to supply the heavy urban populations of this region. In some areas planning for future demands has not kept pace with the population increases, resulting in critical periods during years of low flow.

POLLUTION CONTRIBUTED TO WATER RESOURCES

Population concentrations and industry are the principal contributors to water pollution. A third major factor is silt from soil erosion arising from land mismanagement.

Municipal sewerage systems in this area discharge wastes from a tributary population of over 23 million. In addition these same sewer systems receive the waste discharges from a vast industrial empire. Data are not available on the total pollutional strength of municipal waste discharges, nor is it possible to estimate at this time the relative proportions contributed by industry. In all probability the industrial component of the polluting strength of municipal sewage is roughly equivalent to the domestic component. This, however, is subject to vast variations in individual instances.

Approximately one out of every three persons in the United States who enjoy the convenience of public sewer systems live in this area. If it weren't for the enormous capacity of streams and lakes to absorb and assimilate polluting materials, much more intolerable conditions would exist over vast portions.

More than 1,400 municipalities constitute actual or potential sources of pollution. (Table A) Of these more than one-third are to be commended for satisfactorily treating their waste discharges and thus abating the former pollutional conditions. The actual number of waste outlets to watercourses is considerably in excess of 1,400, because many municipalities, where interceptor sewers have not been constructed, have multiple waste outlets. In large cities, these may run into the dozens or even hundreds.

A great many industries lie outside of municipal corporations, or are located along the streams within the cities. In such cases it is common practice for the industries to discharge their wastes directly to watercourses. An attempt has been made to estimate the number of these, although the completeness of the figures is open to question. It is believed, however, that the major industrial polluters lying outside of the larger metropolitan areas are included in Table B. Acid mine drainage is an important exception.

Almost 1,800 independent industrial waste discharges are recorded, but the detailed characteristics with regard to quantity and polluting strength are available for about 25 percent. Some indication of the magnitude of the industrial contribution is indicated [illegible] the fact that 452 establishments contribu

Table A. Sources of pollution*, municipal

Municipalities**	Sources of pollution (in number of municipalities)	Population served by sewerage system	Amount of pollution discharged to watercourse (in terms of equivalent number of people)***
Having data on pollution load discharged to watercourse	679	7,001,890	6,240,831
Having population data available (Data on pollution load to watercourse incomplete or not available)	749	16,211,690[a]	Not applicable
Total	1,428	23,213,580[b]	--

*The data appearing in this and the subsequent tables for these basins are summations of readily available information. In some cases the data are incomplete. Further, arrangement of data in these tables is difficult because many municipalities have multiple outlets, many of the existing treatment facilities serve several municipalities, and in some cases several treatment plants serve a single municipality. Accordingly, in comparing the tables minor irregularities may become apparent.

In subsequent reports, these inconsistencies will disappear as field investigations are made and the more complete information is obtained.

**Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

***Includes industrial wastes discharged into municipal sewerage systems.

[a] Population data available for 69 municipal sources.

[b] Population data available for 1,376 municipal sources.

organic pollution equivalent to a population of approximately three-and a half million. In addition there are 944 sources of pollution producing organic wastes on which information is not available. An estimated 600 industries discharge wastes of an inorganic nature such as acids, alkalies, and toxic materials, that affect the waters but do not appreciably reduce the oxygen content. In addition to these figures, there are probably a thousand bituminous and anthracite coal operations, many abandoned, discharging acid wastes. Several hundred industrial waste discharges, in metropolitan areas, are not included in Table B, because of the lack of specific information.

Numerous types of industrial wastes varying in quality and quantity are discharged from these establishments into the streams. The wastes include acids, alkalies, oils, phenolic substances, dyes, toxic materials, pulp and wastes, metals, cannery wastes, dairy products, coal and silt.

The discharge of bilge water and other wastes, especially oil, from ships and boats in navigable waters is also an important pollution problem.

The possible pollution of ground water by industrial wastes is becoming of increasing importance, particularly in areas where ground water conservation practices require return of waste water to the aquifer. Two instances serve to illustrate wherein metallic wastes, cyanide and hexavalent chromium have leached to a ground water supply from cesspools and have built up concentrations which necessitated restriction of the use of water supplies.

Table B. Sources of pollution, industrial*

Industries	Sources of pollution (in number of plants)	Amount of pollution discharged to watercourse (in terms of equivalent number of people)
Producing organic wastes	452 [a]	3,597,598
Producing organic wastes	944 [b]	Undetermined
Producing inorganic wastes	592	Not applicable
Producing wastes of undetermined type	84	Undetermined
Total	1,784 [c]	—

*Industries having separate outlets and discharging wastes directly to watercourse.

[a] Includes 131 plants also producing inorganic wastes.

[b] Includes 157 plants also producing inorganic wastes.

[c] Total adjusted to correct for duplications noted in (a) and (b).

DAMAGES TO WATER RESOURCES FROM POLLUTION

The significance of adequate water pollution control and abatement in protecting sources of water supply is seen in the summary of water-borne disease outbreaks in the United States for the years 1938-1948. In this period in the United States there were 408 outbreaks involving 128,954 cases and causing 91 deaths. All the outbreaks were traceable to the use of polluted water due to the breakdown of the purification system or contamination of untreated water supplies. In addition to these reported outbreaks where a disease has manifested itself, there also occurs with fair frequency milk outbreaks of intestinal upset which are usually not reported. The mildness of these outbreaks may not provoke epidemiological investigation, but their widespread occurrence in a community strongly suggests that the water supply may be the carrier by which the causative agent is so rapidly disseminated. The causative agent may be either biological or chemical in nature, but in either case it indicates contaminating material in the water supply which is not satisfactorily removed by the water purification system. The presence of these contaminating agents is indicative of either sewage or industrial pollution. A polluted stream is always a menace to a community's health.

Damages to water resources in the North Atlantic Drainage Basins have, in somecases, been rather extensive. Some of the most polluted areas were found in the waterways of the Greater New York Metropolitan Area. To cope with this problem, the Interstate Sanitation Commission, formed by interstate compact by the States of New Jersey and New York, and later joined by Connecticut, was granted the necessary powers to alleviate the pollution conditions which had developed. This Commission has estimated that economic losses amounting to over $100,000,000 over a 20-year period resulted from damages to the water resources of this region. Shellfish losses from what had been previously one of the most productive regions for this seafood, amounted to $660,000 annually. Fin fish resources showed an 11 percent decline. Losses calculated for two recreational centers, which were closed by pollution, amounted to about $4,000,000 annually. One of these showed a 92.4 percent loss in property value over a period of 35 years on an initial investment of $5,000,000. The damages to the remaining waterfront areas of this region resulting from pollution remains incalculable, but can be readily appreciated by any one who has seen the submarginal conditions of some of the waterfront properties along the shores of the East River, Harlem River, Newark Bay, and the inshore waters around Staten Island. The recreational assets of miles of waterfront have been completely negated by pollution.

The heavy sewage pollution in the Potomac River at Washington has been estimated by the Interstate Commission on the Potomac River Basin to exceed 1 million dollars damage annually.

Industrialization of limited stretches of waterways has in several instances led to severe damages to water resources. On the North Branch of the Potomac, the acid mine drainage plus industrial and sanitary wastes have so damaged the water quality that these waters hardly respond to standard treatment methods for industrial purposes. On the Delaware pollution from both industrial and sanitary wastes became so gross in the region of Philadelphia and Camden that the use of the stream even for navigational purposes was impaired, and downstream the City of Chester had to seek new sources of municipal water. Along the Niagara River, the availability of cheap hydro-electric power attracted many industries and the associated population needed to operate them. Excessive pollution from industrial and sanitary wastes is receiving the attention of the International Joint Commission in order to abate these conditions.

Long stretches on the Mohawk and Hudson Rivers are so damaged by pollution that these valuable waters would be hazardous to use for domestic water sources even in emergency situations. The industrial effluents along the Hudson and Delaware Rivers have been cited as one of the causes for the decline in the valuable shad fishery of these streams. Frequent fish killings have occurred throughout the streams of this region from industrial wastes dumped directly into streams or from leakage of impoundments of industrial effluents.

Acid mine drainage has seriously affected the waters of the North Branch of the Potomac, the West Branch of the Susquehanna, portions of the North Branch of the Susquehanna, and to lesser degrees several other streams. This damage may prove to be permanent and restricts the usage of these streams.

Silt caused by soil erosion is a problem in several streams in this region. The Monocacy River contributes a very heavy silt load to the Potomac and materially increases the cost of water treatment at Washington, D. C., in addition to the annual dredging costs to keep the navigation channels open in the tidewater Potomac. It is estimated by the Soil Conservation Service that 75 percent of the area of the North Atlantic Drainage Basins is in need of some soil conservation treatment. The Schuylkill River, of the Delaware drainage basin, has been severely damaged by the pollution from the anthracite coal washing operations along its shores. In some coastal areas such as Central New Jersey and Long Island, construction of wells to supplement surface water supplies has caused a very high drawdown and, consequently, damage due to salt water intrusion.

BENEFITS RESULTING FROM POLLUTION PREVENTION AND ABATEMENT

With water acting as a carrier of many enteric diseases adequate sewage treatment and control of sanitary waste discharges are essential to the maintenance of health standards, particularly when one considers that over 30 million people live in these basins, the majority of whom depend on surface water supplies. Although modern water treatment techniques deliver a product which is essentially sterile, reduction in the pollution load contributed to the sources of these water supplies has been extremely beneficial in reducing the potential health hazard, and improving potability. Continued reduction in the pollution load will further relieve excessive burdens placed on water treatment processes and will enable the production of more palatable waters.

Where pollution abatement has been effected, recreational pursuits have benefited by reduced disease potentialities. Projects now under construction will be particularly beneficial in this respect in the New York area. Reduction in pollution over shell fish bottoms has permitted reopening areas for production which had been closed due to the health hazard.

Reclamation of streams from industrial pollution is likewise beneficial. An excellent example was the severe damage suffered by the Shenandoah River from industrial pollution. This pollution, of unusual toxic nature, wiped out the fish food and what was considered the best small mouth bass fishery in the eastern United States. A virtual biological desert was created. Yet by such indices as biochemical oxygen demand and dissolved oxygen, the stream was not considered polluted. By cooperative efforts of the plant operators and various interested groups, the pollution has been reduced to a point where the stream is once more supporting an aquatic population.

Economic benefits derived from reclamation of materials which had formerly been discharged to streams not only are of value in restoring the water quality but are also of economic value to plant operation. Many cases of this type can be cited. Many paper mills in the North Atlantic Drainage Basins have instituted recovery processes and changes in plant operation which save large quantities of alkalies, pulp, carbon, and other materials which had previously contributed to stream degradation. One plant recovers over nine tons of usable pulp per day. Several steel mills have instituted treatment processes which recover iron from the water used for gas scrubbing. In one mill a net saving of more than $580,000 annually was realized in recovering this material which formerly went into the stream.

Recovery processes in a zinc plant, located in this area, salvaged more than 35 tons of zinc in one month, with extreme benefit to the stream into which it formerly was wasted. An alcohol plant reclaims its spent mashes and processes it into an animal feed that is worth considerable sums. Some abbatoirs and rendering plants reclaim certain wastes. Waste treatment operations of by-product coke plants recover valuable phenolic substances from their operations, materials which were extremely detrimental to receiving streams.

The Schuylkill River Restoration Project is already producing noteworthy benefits. Here an entire river which had been badly misused and degraded by coal washings from the anthracite mines, other industrial wastes, and sewage, is being restored. The silted river channel is being dredged to restore its capacity and thus materially reduce the danger of floods. Water treatment costs are being reduced. Its recreational value, entirely gone at one time, is being restored. The life of equipment using this water will be lengthened. Some benefits from the dredging operations will accrue, since the silt contains so much culm that much is saleable as boiler fuel. Desilting basins installed by anthracite collieries are returning handsome profits through the sale of recovered coal.

POLLUTION PREVENTION MEASURES IN EFFECT

Over 13.7 million people are served by sewage treatment facilities providing varying degrees of treatment. This is well over half of the people in the area served by sewerage. More than 60 percent of the municipal sewer systems are provided with treatment, indicating that in general the larger municipalities have failed to keep pace with the smaller communities (Table C) This situation, however, is rapidly changing.

Less optimistic is the picture obtained by viewing the adequacy of the treatment facilities provided. One would anticipate that facilities constructed thirty or more years ago would be outmoded or outgrown. This is exactly the case. Of the population served by treatment facilities about half enjoy the distinction of being considered adequately served. In numbers of municipalities with treatment plants, the situation is brighter. Of 873 treatment plants, 526 or 60 percent are judged substantially capable of meeting current demands. (Table E)

Data on industrial waste discharges are much less conclusive than those for municipalities. Industrial wastes are oftentimes discharged directly into municipal sewer systems, with or without pretreatment, in which case they do not appear as sources of pollution. The data compiled indicate the existence of almost 1,800 independent industrial waste discharges into the streams of the North Atlantic Drainage Basins. It is believed that these figures include all principal sources of pollution, with the exception of discharges in the major metropolitan areas, which have not as yet been investigated, and acid mine discharges. There are probably well over 600 additional industries in New York City alone that are not included in these figures and a thousand or more acid mine discharges.

Approximately 44 percent of the industrial establishments recorded produce food and kindred products with textile, paper, metal products, and chemical industries and their allied products each comprising about 7 percent. The mining establishments consisting principally of anthracite operations comprise about 9 percent of the establishments, petroleum and coal products about 3 percent and miscellaneous about 44 percent. However, treatment facilities are provided for approximately 40 percent of the petroleum and coal products manufacturers and 80 percent of the mining establishments, 61 percent of the leather and leather products establishments, 41 percent of miscellaneous industries, with the other varying from 27 to 41 percent except lumber and wood products establishments. (Table D)

Over one-third of the industries listed have provided treatment facilities. Somewhat over half of the industrial waste treatment facilities are regarded satisfactory, both with respect to capacity and operation. Since data concerning the amounts of pollution discharged are not available, it is impossible to draw comparisons between the quantities of pollution discharged to watercourses through municipal sewer systems and the quantities of industrial wastes discharged independently. In terms of numbers of plants, however, it is indicated that industry is considerably behind municipalities in caring for waste discharges. Over 60 percent of the municipalities have treatment facilities, whereas only about 39 percent of the industries are likewise equipped, and this latter fraction will be subject to considerable reduction when all industrial discharges are recorded.

Progress in pollution abatement during the postwar period is disappointing when viewed solely in relation to construction completed during the years 1946 to 1949 inclusive. (Table F) But it must be remembered that the materials and labor situation during the immediate postwar period were such that construction of this type was practically precluded. Encouraging is the momentum gained during 1948, when 21 plants were constructed by municipalities and this increased to 32 in 1949. During the four postwar years of 1946-1949 inclusive, 63 municipal treatment plants were constructed or enlarged. Population data available indicate that 58 of these plants can serve a population of over 890,000 people. A tremendous change in these figures, particularly on the population side, will take place during the next three years, when the large pollution abatement projects now under construction in New York City and Philadelphia will be completed. A considerable spurt in the numbers of treatment works constructed is also anticipated, due largely to the construction orders issued by the Sanitary Water Board in Pennsylvania.

An indication that industry is also falling in line is the fact that 127 industries have completed treatment works during this same period, and a great many more will follow suit in the next few years.

A comprehensive view of pollution prevention measures in effect cannot be gained merely by quoting statistics on numbers and sizes of treatment works. Many other factors must be considered to gain a complete picture.

In fact, current progress is reflected probably less by actual construction than by activities preliminary to such construction. Research has been stimulated on many difficult pollution problems. Among the most encouraging aspects of current progress has been the recent strengthening of State laws governing pollution, resulting in the establishment of pollution control agencies; the increasing cooperation shown by industries and the upholding by the courts of the legislation enacted.

Entirely new legislation has been enacted since 1946 in the States of Virginia, Maryland, Delaware, New York, and Vermont. All States are regarded as having reasonably adequate legislation to control water pollution within their borders. However, the West Virginia law specifically omits jurisdiction over coal mine wastes, including culm; the Maryland law is weak in its provisions for preventing pollution before it has occurred; and New York lacks the necessary personnel to administer its law.

Executive Order 10014 issued by President Truman on November 5, 1948, further strengthens control of State agencies. In substance, the Executive Order directs Federal agencies to cooperate with State and local authorities in abating pollution caused by Federal installations and activities.

In general, the States in the North Atlantic Drainage Basins are carrying out aggressive programs. Pennsylvania and New Jersey lead the parade and others are following suit in varying degrees. In conformance with comprehensive water pollution control legislation enacted in 1949, the New York State Water Pollution Control Board, through the State Department of Health, has completed in creditable fashion, the difficult task of preparing standards for the classification of waters. Much credit is due this accomplishment. However, application of these standards to the entire State will require 10 to 20 years at the present rate of progress, and no waters come within the jurisdiction of the act until classification has been made. Current progress is given stimulus through the advance planning grants provided by Pennsylvania and New York for their municipalities. Similarly, interest-free loans for advance planning purposes in all States have been available through the Community Facilities Service, Housing and Home Finance Agency.

Interstate Agencies

Of extreme importance in highly congested industrialized areas such as are found in this region, is the high degree of interstate cooperation that has been developed. Four interstate agencies have principal interests in the North Atlantic Drainage Basins, one of which extends beyond its confines. A fifth, the New England Interstate Water Pollution Control Commission,[4] is concerned only with the Hoosic River and Batter Kill, tributaries of the Hudson River, insofar as this report is concerned.

The Interstate Sanitation Commission, formed by compact among the States of New York, Connecticut, and New Jersey, has jurisdiction generally over the tidal waters in the New York-Northern New Jersey and Southern Connecticut Metropolitan Areas. Its aggressive program, begun in 1936, involves some of the largest treatment works in the world. Currently, some 210 million dollars worth of work is underway and another 170 million dollars worth is programmed. Definitely in sight by the end of 1953 are pollution abatement works that will protect all recreational waters in the metropolitan area and the abatement of other pollution in New York Harbor by 1959.

The Interstate Commission on the Delaware River Basin (INCODEL), formed by the States of Delaware, New Jersey, New York, and Pennsylvania, is interested in total resource conservation measures, water conservation and pollution abatement being important parts. The need for increasing dry weather flows in the lower Delaware to prevent the intrusion of salt water is of major importance. While it has no legal authority to order abatement, it operates through promoting the adoption of uniform State legislation covering the Delaware River Basin. Through its influence the Delaware River has been divided into four different zones, and specific requirements for treatment of all wastes being discharged into the respective zones have been enacted into law in the respective States. In the Delaware Basin, well over 140 million dollars worth of work is now underway, including the Schuylkill River Restoration Project by the State of Pennsylvania. Most of Pennsylvania's work in removing silt has been completed under this project and the principal remaining task of dredging the stream below Norristown down to the Delaware has been agreed to be undertaken by the Corps of Engineers. Appropriations for completing this work, however, have not yet been made.

A third interstate agency, formed by Maryland, Pennsylvania, Virginia, West Virginia, the District of Columbia, and the United States, is the Interstate Commission on the Potomac River Basin with headquarters in Washington, D. C. It has been in operation since 1941. It is interested primarily in the control of pollution and serves as a mechanism for coordinating the activities of the various State and Federal agencies within the Basin. The Commission has been a strong influence towards pollution abatement since its formation, its strength lying in a public relations and information program designed to acquaint the people with the problems involved. Through its efforts industry has been made a partner in the tremendous undertaking of reclaiming the

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[4] The Hoosic River and Batten Kill are within the New England Interstate Compact area and therefore are handled by the New England Drainage Basins office except for this summary report.

Potomac Basin and industry's attitude is now one of fuller cooperation.

The Atlantic States Marine Fisheries Commission, an interstate agency of all of the Atlantic seaboard States, with headquarters at Mt. Vernon, N. Y. is interested primarily in improving the marine fisheries and thus exerts its influence toward abatement of any pollution which may affect such fisheries.

The international aspect of pollution, involved primarily in the Buffalo area and the Niagara River, are under jurisdiction of the International Joint Commission. Representatives of the Canadian and United States Governments and the affected States and Provinces are included on this Commission. An extensive survey of the industrial and municipal pollution contributed to the waters in the Buffalo metropolitan area and Niagara River was conducted recently and hearings were held in the fall of 1949. A report of the findings and recommendations for corrective action has been recently published. The rejuvenation of this Commission contributes decidedly to current progress in pollution abatement.

State Programs

While the approach of the various State agencies is somewhat different, the underlying philosophy and basic principles are substantially parallel. In the following paragraphs an attempt will be made to point out the similarities in requirements of the State agencies.

In New York State, waters are required to be classified in accordance with best usage, and standards to be maintained commensurate with such usages have been prepared. A detailed review of these standards reveals that, for all practical purposes, the minimum degree of treatment that will be acceptable before any wastes can be discharged into a classified stream will be substantially equivalent to primary treatment - that is, removal of settleable solids and floating materials. Where use dictates, additional treatment methods will be necessary.

The Pennsylvania Sanitary Water Board requires a minimum of primary treatment of all municipal wastes and an equivalent degree of treatment for all industrial wastes. Higher degrees of treatment are required where dilution water is insufficient to care adequately for the discharges from primary treatment plants or where water use dictates higher degrees of treatment are necessary. These requirements apply to all streams, except those already damaged by acid mine drainage which cannot be corrected at present.

The West Virginia Water Commission has classified the waters in the Potomac Basin in West Virginia into four classes and has mapped out a program for elevating the water quality in each zone so that eventually standards commensurate with desirable uses will be met.

The Maryland Water Pollution Control Commission has adopted regulations specifying standards for industrial wastes to be applied to all industrial wastes within the State irrespective of the location of the industry. These standards appear substantially equivalent to primary treatment (removal of settleable and floating materials). They are considered to be minimum and are made more stringent where water use demands.

The Virginia Water Control Board is committed to preventing any new or increased pollution and has launched an aggressive program to accomplish reduction of existing pollution. Although no standards have been adopted, no approvals have been given for the installation of treatment facilities providing less than substantially that afforded by primary treatment.

The New Jersey State Department of Health, on November 1, 1927, announced the policy that thereafter it would require that all sewage prior to its discharge to any waters of the State, be subjected as a minimum to a degree of treatment consisting of effective sedimentation. Most watershed areas have been zoned and minimum degrees of treatment established in the respective zones based upon uses of the waters. The minimum of sedimentation is now acceptable only in the Class "B" waters of Interstate Sanitation District and some locations in Zone 4 of the Delaware River. In all other areas higher degrees of treatment are required. Effluent standards have been established for discharges into many of the waters of the State.

The Delaware Water Pollution Control Commission is just beginning to launch its program in accordance with the legislation passed in 1949. It proposed to classify the streams in accordance with use and establish commensurate standards. It is anticipated that effective sedimentation and removal of floating materials will be required as the minimum treatment allowable.

Thus it will be seen that while the methods of expression vary from State to State and there are differences in approach, some basing their requirements entirely on the stream and others establishing socalled effluent standards in certain zones, all are in substantial agreement that effective sedimentation is the minimum to be applied and that higher degrees of treatment are necessary where important water uses must be protected or nuisances must be prevented.

While the laws for the control of pollution are considered generally adequate and the objectives of the administrative agencies enforcing these laws are substantially parallel, there is considerable variation in detailed methods of procedure which results in a certain degree of confusion. In some cases stream standards are used, in some effluent standards are used, and in other cases combinations of stream standards and effluent standards have been adopted. Interpretations of terminology employed probably accounts for much of the confusion in the minds of those not intimately familiar with all procedures.

The Pennsylvania Sanitary Water Board has developed standards for wastes for several industries, working in cooperation with committees representing industry groups. These standards take into consideration what would be a normal type waste from a well-run plant. A carelessly-operated plant with poor housekeeping practices may have wastes several times the quantity and strength of those from a well-run plant. In application, when treatment is required, the base from which degrees of treatment are specified is the standard waste and not the actual waste from any particular establishment. Thus the careful operator is not unduly penalized and the careless operator is required to prevent needless waste in addition to the treatment specified. Standards have been adopted for the disposal of wastes from oil and natural gas wells, the disposal of wastes from wells other than oil and natural gas wells, for the treatment of wastes from milk plants, for the disposal of wastes related to acid pickling wastes from metallurgical plants, and for the wastes from pulp and paper mills. An experimental project is also underway for attempting to reduce or eliminate acid discharges from strip mining operations.

Table C. Existing treatment facilities, municipal

Degree of treatment provided	Number		Population served
	Municipalities*	Plants	
Primary	425	448 [a]	7,728,682 [b]
Secondary	417	425	6,000,136 [c]
No treatment	559	—	9,484,762 [d]
Total	1,401 [e]	873	23,213,580 [f]

*Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

[a] Includes 17 screening plants.

[b] Population data available for 421 municipalities.

[c] Population data available for 402 municipalities.

[d] Population data available for 542 municipalities.

[e] Does not agree with total of 1,428 shown in Table A, due to multiple sources of pollution in some municipalities.

[f] Population data available for 1,365 municipalities.

In addition to the programs of the State and Interstate agencies are the operations of the Corps of Engineers, the Coast Guard, and the Supervisor of New York Harbor, in preventing and controlling oil pollution. Oil pollution is one of the most damaging and dangerous forms of pollution occurring in the harbor areas and shipping lanes. Considerable reduction in oil pollution has taken place through the efforts of the foregoing agencies, together with the control programs of the State agencies. However, there is still altogether too much oil floating in the harbor areas. Possibly greater educational efforts among vessel personnel, in addition to the enforcement activities, would produce better results.

Comprehensive legislation with adequate enforcement provisions is unquestionably indispensable to the attainment of the ultimate objective--clean streams. However, the awakening of control agencies to the necessity of informing the public of the urgency of pollution abatement programs is of importance. It is better to bring about public acceptance and approval of pollution abatement programs through education, using the enforcement provisions of the law to be administered as the last resort, than it is to arouse resistance through "big stick" methods. Pennsylvania's program is outstanding in that public health hazards and economic losses are cited, and the advantages to industry and to the people through the protection of the waters of the State are brought to their attention. In some States as New Jersey, the handling of municipal pollution is essentially one of providing additions and alterations rather than construction of new plants.

The development of local and national conservation groups to further promote these aspects is probably the most encouraging trend. Noteworthy of mention are the Brandywine Valley Association, the Lehigh Valley Flood Control Council, the Monocacy Valley Council, the Route 97 Council, the Mohawk Valley Sanitation Council, and many other conservation groups such as the Izaak Walton League with its local chapters, the National Wildlife Federation, and the interest displayed by various civic groups and women's organizations.

Table D. Existing treatment facilities, industrial*

Type industry	Number of plants	Number of industrial plants having: Treatment facilities	No treatment facilities	Undetermined facilities
Food and kindred products................	787	282	337	168
Textile mill products................	135	37	82	16
Lumber and wood products................	5	--	3	2
Paper and allied products................	133	36	90	7
Chemical and allied products................	116	42	42	32
Petroleum and coal products................	45	18	14	13
Rubber products..........	6	2	4	--
Leather and leather products................	26	16	9	1
Primary metal products................	29	12	10	7
Fabricated metal products................	97	27	58	12
Mining....................	159	128	15	16
Miscellaneous............	246	102	91	53
Total................	1,784	702	755	327

*Industries having separate outlets and discharging wastes directly to watercourses.

NOTE: In addition to the ertablishments listed there are probably one thousand bituminous and anthracite coal operations, many abandoned, discharging acid wastes.

Table E. Adequacy of existing treatment facilities

Existing treatment facilities	Number	Adequacy with relation to: Capacity: Satis-factory	Unsatis-factory	Unde-termined	Operation: Satis-factory	Unsatis-factory	Unde-termined
Municipal	873 [a]	526 [b]	222 [c]	125 [d]	648 [e]	82 [f]	143 [g]
Industrial	702	381	129	192	381	88	233

a Population data available for only 838 plants which serve 13,728,818.
b Population data available for only 500 plants which serve 6,953,254.
c Population data available for only 216 plants which serve 6,087,408.
d Population data available for only 122 plants which serve 688,156.
e Population data available for only 620 plants which serve 11,479,679.
f Population data available for only 79 plants which serve 1,148,514.
g Population data available for only 139 plants which serve 1,100,625.

Table F. Progress in pollution abatement

Year	Municipal		Industrial	
	Plants completed	Design population	Plants completed	Amount of waste treated (in terms of equivalent number of people)
1946	4	2,800 [a]	5	165 [e]
1947	6	37,560 [b]	28	--
1948	21	82,825 [c]	48	642 [f]
1949	32	769,870 [d]	46	32,000 [g]

[a] Design population data for 3 plants.

[b] Design population data for 5 plants.

[c] Design population data for 19 plants and includes 4 plants enlarged, serving 11,065 population.

[d] Design population data for 26 plants and includes 5 plants enlarged, serving 154,000 population.

[e] Population equivalent data available for 1 plant.

[f] Population equivalent data available for 12 plants.

[g] Population equivalent data available for 4 plants.

POLLUTION PREVENTION MEASURES REQUIRED

The pollution abatement facilities needed by municipalities in the North Atlantic Drainage Basins are tremendous. (Table G) Four hundred and thirty-nine, or about one-third of the municipalities with a tributary population of over 9, 200, 000 require new treatment works, and 285 enlargements or replacements of existing plants are needed to adequately serve 8, 000, 000 people.

Five hundred and twenty municipalities with a tributary population of approximately 5, 400, 000 are not in need of projects at present and the requirements have not been determined for 180 municipalities with a tributary population of more than 500, 000 persons.

The biggest task is to provide facilities where none now exist, because this involves the construction of intercepting sewers in many cases, to bring the wastes to the proposed treatment works. Interceptors, particularly for the larger cities, may cost considerably more than the treatment works themselves, and in any case the cost is likely to be equivalent. Some sections of an interceptor recently constructed in New York City cost over $1, 500 per foot.

It is difficult to conceive of the total quantity of sewage flow from the 23, 000, 000 tributary population. At 150 gallons per capita per day, a good average figure, the flow amounts to 3, 450 million gallons per day. This is equivalent to a stream discharging 5, 300 cubic feet per second, which is about half the average flow of the Potomac River near Washington, D. C., or about the same as the average flow of the Mohawk River at its mouth. If this quantity were confined to one square mile of area during one day, it would reach a depth of 17 feet.

It is obvious from the number of enlargements, replacements, and additions that are needed, that the task of keeping up-to-date with growing populations, increasing industrial activity, and population shifts, is endless. Much of the early progress in pollution abatement took place prior to 1930. Several of these plants now need replacement. The greatest growth in abatement activity occurred during the depression years of the 1930's. (See the accompanying figure "Growth in Sewage Treatment"). Practically all treatment works now in operation are 10 or more years old.

Considerable activity in industrial wastes pollution abatement is reflected by the 426 instances where no projects are required. However, this is not more than 24 percent of the total number of sources of industrial waste pollution reported. When all of the existing sources of industrial waste pollution become known this percentage will probably be reduced.

A complete picture of the current status of pollution abatement activity cannot be obtained without delving into the action preliminary to actual construction. Few people realize the tremendous amount of work involved to bring a large pollution abatement project into being even before the first spade of earth has been turned. An engineering study of the project must be undertaken, preliminary reports prepared, and on the basis of this information, proposals for financing must be drafted. In many cases bond issues requiring a vote of the people will be involved. Detailed engineering plans must be prepared and this is followed by advertising for bids. Subsequent to the letting to the successful bidder, from one to five years or more may be required before the first gallon of sewage can be treated in the plant. Completion of the expansion and improvements to the Washington, D. C. plant is not anticipated before 1957, and the work is already underway.

State pollution control agencies have 221 municipalities and 243 industries under orders to abate pollution. Many of the major polluters are included in this group, thus a considerable proportion of the total pollution is represented. With respect to industry, probably 90 percent of the pollution is accounted for by 10 percent of the industries. However, the remaining 90 percent of the industries that contribute 10 percent of the pollution cannot be overlooked and the wide dispersal of these industries results in an administrative load to the pollution control agencies of considerable proportions.

Pollution abatement projects under construction--35 municipal and 43 industrial--appear small in relation to the total needed, but among these are the tremendous undertakings of New York City, Philadelphia, and Washington, D. C. However, the time has definitely arrived for more of the projects with final plans approved--to move down into the "under construction" column. (Table H)

The physical needs as reviewed in the foregoing cannot represent the total requirements for gaining the ultimate objective. Technical knowledge is inadequate to cope with some problems. Prominent among these is the acid mine drainage problem. Hundreds of miles of streams are ruined by acid discharges from mines, as much remains to be learned about the problem of acid mine waste pollution. Both alkaline and acid wastes may be draining from the same mine. An explanation for this phenomenon is sorely needed. Some industrial wastes are not amenable to known methods of treatment. There is dire need for more economical methods of municipal waste treatment. With the magnitude of the task facing us, greatly accelerated research programs are indicated.

Table G. Requirements for municipal and industrial waste treatment plants*

Requirements **	Municipal		Industrial
	Number	Population served by facilities	Number
New plant	439	9,256,596	683
Enlargement or additions to existing plant	224	7,049,330	184
Replace existing plant	61	979,046	13
No project required	520	5,413,540 [a]	426
Undetermined	180	515,068 [b]	478
Total	1,424	23,213,580 [c]	1,784

*The needs set forth in this table are based on presently available information. However, future studies and evaluations may result in some changes in these needs.

**For individual project needs refer to Table I contained in each of the sub-basin discussions which follow Part 1 of this report.

[a] Population data available for 509 sources.

[b] Population data available for 143 sources.

[c] Population data available for 1376 sources.

Note: The required facilities will in many cases, particularly in the metropolitan areas, be provided through joint interceptors and treatment works.

Thorough and systematic studies of municipal financing provisions as they relate to sewerage construction are sorely needed in many cases. Such a study is now underway by the Ostertag Committee in New York State.

All pollution control agencies need additional staff to investigate the problems more thoroughly. This is clearly indicated by the absence of complete data on pollutional conditions. Control programs and construction programs must be accelerated if the ground gained is to be held and the backlog overtaken.

As with other types of pollution, the problem of controlling oil pollution is far from solved. Further problems that will become more important as harbor areas are cleared up are those of pollution discharges from vessels, both commercial and pleasure craft. Particularly with regard to ocean liners, consideration must be given in the design stage if pollution from these vessels is to be eventually eliminated from great harbor areas.

Table H. Status of treatment works project to abate pollution, July 1, 1950

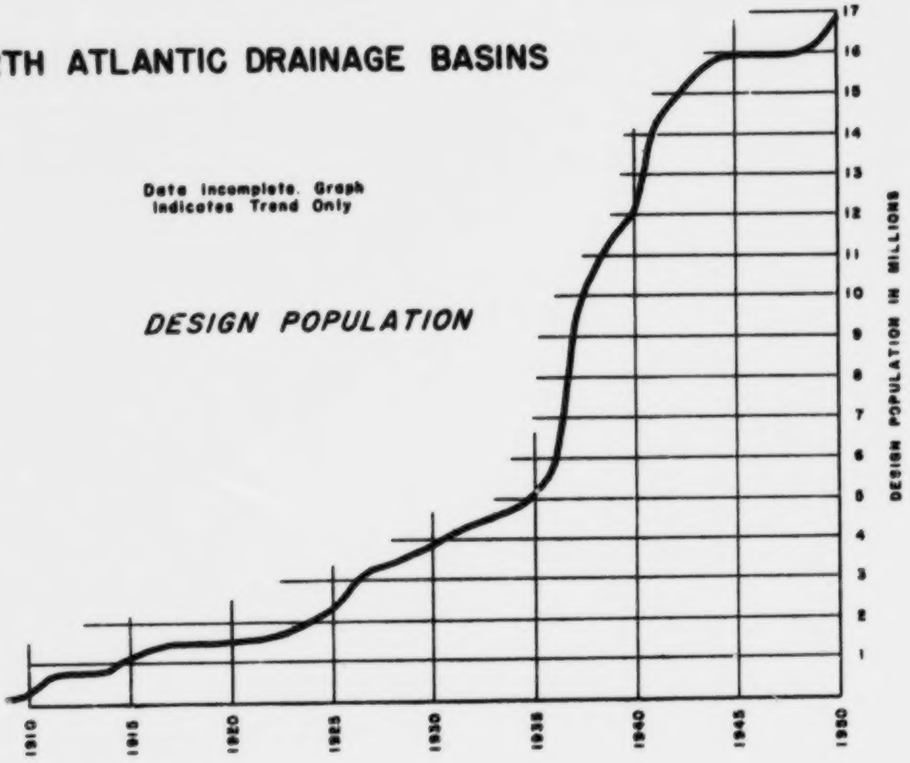
Status of project	Number	
	Municipal	Industrial
No formal action	338	752
Abatement ordered	221	243
Plans under preparation	108	64
Final plans approved	225	56
Construction awaiting financing	10	—
Under construction	35	43
Status undetermined	54	112

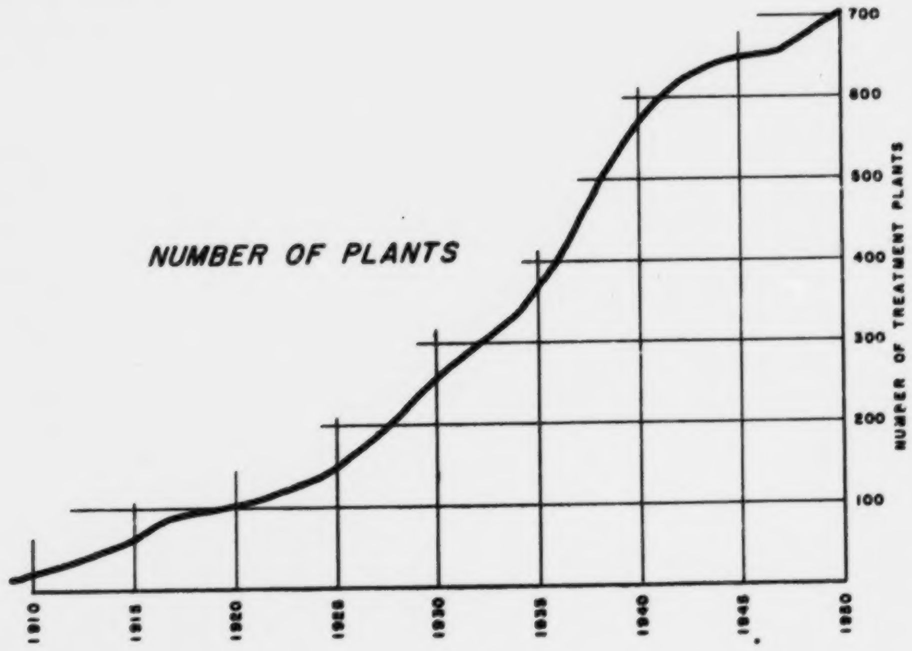
Note: Several projects in the planning stage or under construction are for joint interceptors and treatment works.

GROWTH IN SEWAGE TREATMENT

(ACCUMULATIVE TOTALS FROM 1910 TO 1950)

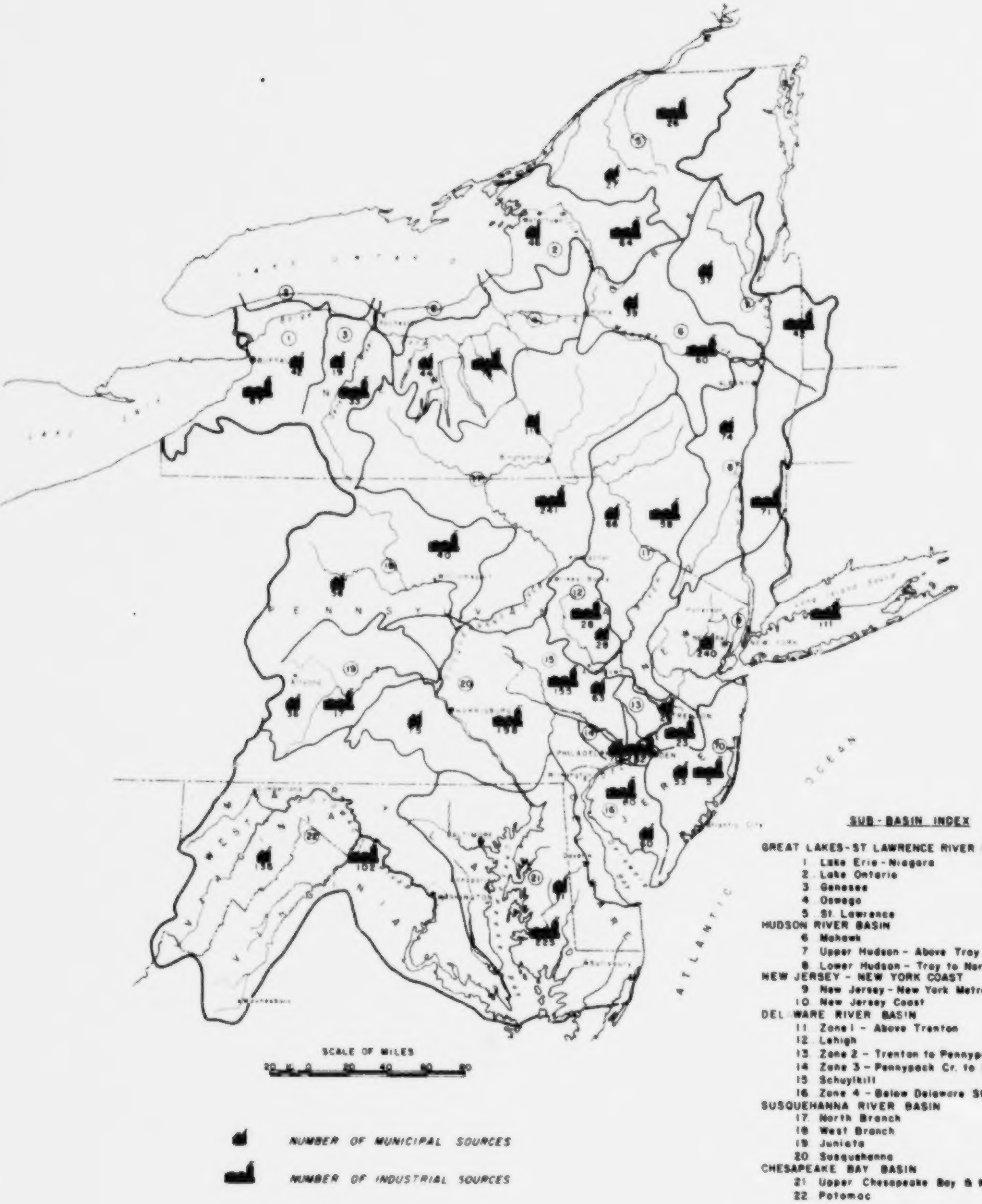
NORTH ATLANTIC DRAINAGE BASINS





19-a

963509 O - 51 (Face p. 18) No. 1


LAKE ONTARIO
LAKE ERIE
PENNSYLVANIA
ATLANTIC OCEAN
SCALE OF MILES
20 10 0 20 40 60 80
NUMBER OF MUNICIPAL SOURCES
NUMBER OF INDUSTRIAL SOURCES

SUB-BASIN INDEX

GREAT LAKES-ST LAWRENCE RIVER BASIN
- 1 Lake Erie-Niagara
- 2 Lake Ontario
- 3 Genesee
- 4 Oswego
- 5 St. Lawrence

HUDSON RIVER BASIN
- 6 Mohawk
- 7 Upper Hudson - Above Troy
- 8 Lower Hudson - Troy to Northern Westchester Co. Line

NEW JERSEY - NEW YORK COAST
- 9 New Jersey - New York Metropolitan Area & Long Island
- 10 New Jersey Coast

DELAWARE RIVER BASIN
- 11 Zone 1 - Above Trenton
- 12 Lehigh
- 13 Zone 2 - Trenton to Pennypack Creek
- 14 Zone 3 - Pennypack Cr. to Delaware State Line
- 15 Schuylkill
- 16 Zone 4 - Below Delaware State Line

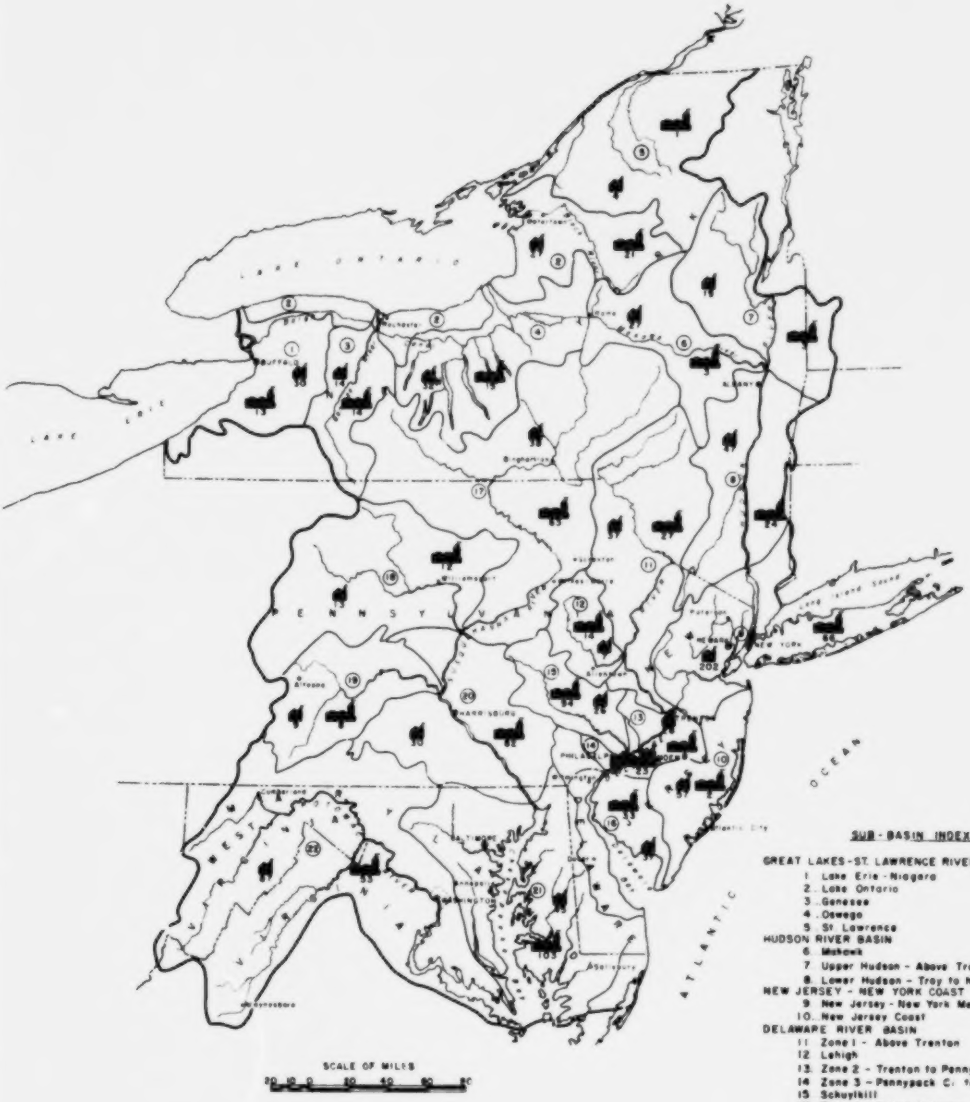
SUSQUEHANNA RIVER BASIN
- 17 North Branch
- 18 West Branch
- 19 Juniata
- 20 Susquehanna

CHESAPEAKE BAY BASIN
- 21 Upper Chesapeake Bay & Maryland - Delaware Coast
- 22 Potomac

NORTH ATLANTIC DRAINAGE BASINS
SOURCES OF POLLUTION
FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 1

19-4

963509 O - 51 (Face p. 18) No. 2


LAKE ONTARIO
LAKE ERIE
Buffalo
Rochester
Binghamton
Albany
Williamsport
Altoona
Harrisburg
PENNSYLVANIA
Paterson
Newark
NEW YORK
Long Island Sound
Philadelphia
Wilmington
Atlantic City
ATLANTIC OCEAN
Baltimore
Washington
Cumberland
WEST VIRGINIA
Salisbury
202
103
SCALE OF MILES
20 10 0 20 40 60 80

■ NUMBER OF EXISTING MUNICIPAL TREATMENT WORKS

■ NUMBER OF EXISTING INDUSTRIAL TREATMENT WORKS

SUB-BASIN INDEX

GREAT LAKES-ST. LAWRENCE RIVER BASIN
- 1 Lake Erie-Niagara
- 2 Lake Ontario
- 3 Genesee
- 4 Oswego
- 5 St. Lawrence

HUDSON RIVER BASIN
- 6 Mohawk
- 7 Upper Hudson - Above Troy
- 8 Lower Hudson - Troy to Northern Westchester Co. Line

NEW JERSEY - NEW YORK COAST
- 9 New Jersey - New York Metropolitan Area & Long Island
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DELAWARE RIVER BASIN
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- 13 Zone 2 - Trenton to Pennypack Creek
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- 16 Zone 4 - Below Delaware State Line

SUSQUEHANNA RIVER BASIN
- 17 North Branch
- 18 West Branch
- 19 Juniata
- 20 Susquehanna

CHESAPEAKE BAY BASIN
- 21 Upper Chesapeake Bay & Maryland - Delaware Coast
- 22 Potomac

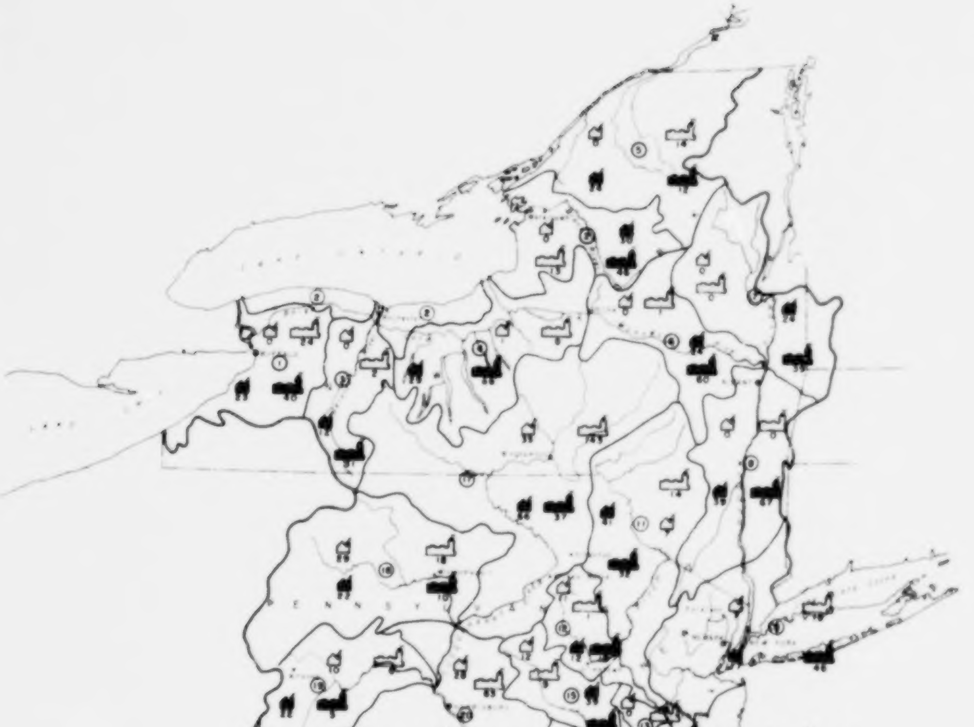
NORTH ATLANTIC DRAINAGE BASINS
EXISTING TREATMENT WORKS

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL

MAP NO. 2

963509 O - 51 (Face p. 18) No. 3

19-C



SUB-BASIN INDEX

GREAT LAKES-ST LAWRENCE RIVER BASIN
- 1 Lake Erie - Niagara
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CHESAPEAKE BAY BASIN
- 21 Upper Chesapeake Bay & Maryland - Delaware Coast
- 22 Potomac

■ *NUMBER OF MUNICIPAL PROJECTS REQUIRED*

□ *NUMBER OF MUNICIPALITIES WITH PROJECT REQUIREMENTS UNDETERMINED*

■ *NUMBER OF INDUSTRIAL PROJECTS REQUIRED*

□ *NUMBER OF INDUSTRIES WITH PROJECT REQUIREMENTS UNDETERMINED*

NORTH ATLANTIC DRAINAGE BASINS
PROJECTS REQUIRED
FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 3

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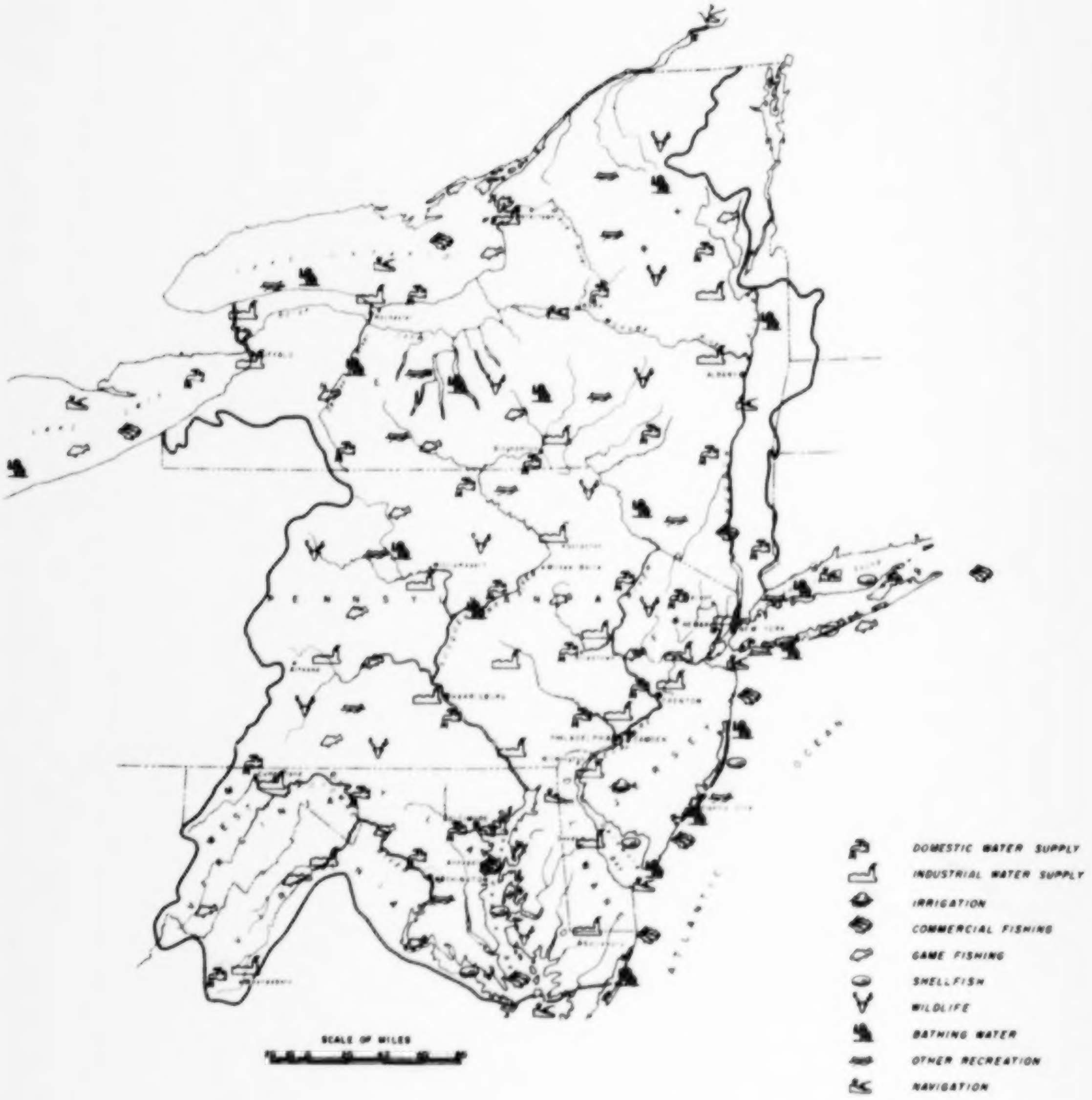

ATLANTIC
OCEAN
SCALE OF MILES
DOMESTIC WATER SUPPLY
INDUSTRIAL WATER SUPPLY
IRRIGATION
COMMERCIAL FISHING
GAME FISHING
SHELLFISH
WILDLIFE
BATHING WATER
OTHER RECREATION
NAVIGATION

NORTH ATLANTIC DRAINAGE BASINS

EXISTING PRIMARY WATER USES

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL

MAP NO. 4

14-E

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SUB-BASIN REPORTS

GREAT LAKES-ST. LAWRENCE RIVER BASIN

Sub-Basins
- Lake Erie-Niagara River
- Lake Ontario
- Genesee River
- Oswego River
- St. Lawrence River

General Description

For the purposes of this report, the Great Lakes-St. Lawrence River Basin consists of the Lake Erie-Niagara River Sub-Basin; Lake Ontario Sub-Basin; Genesee River Sub-Basin; Oswego River Sub-Basin, and the St. Lawrence River Sub-Basin. The total area is 22,600 square miles, comprising about 46 percent of the area of New York State; and 96 square miles in Pennsylvania.

The drainage basin includes the shore of Lake Erie, lying in New York State; Cattaraugus Creek; Niagara River; the entire south shore of Lake Ontario, the principal tributaries of which are the Genesee, Oswego (including the Finger Lakes), and Black Rivers; and the St. Lawrence River with its principal tributaries, the Oswegatchie, Grass, Raquette, St. Regis, Salmon, and Chateaugay. It is bounded by the drainage basins of the Ohio and Susquehanna Rivers on the south, the Hudson River and Lake Champlain on the east.

The topography of the area is varied. Strips of level land along the lakes, known as the Ontario Plain, extend 160 miles east and west along Lake Ontario and southward 30 to 40 miles. The Ridge, an outcropping edge of the massive Niagara limestone, running east and west through the western part of the Lake Ontario Plain, extends to the Niagara River and produces Niagara Falls.

The Finger Lakes region is a series of north-south valleys, the sides of which rise abruptly to the broad back of the Allegheny Plateau. Tributary streams have cut glens and produced many waterfalls. Taughannock Falls near the head of Cayuga Lake plunges 215 feet, the highest waterfalls east of the Rockies.

The St. Lawrence Valley is a narrow inner lowland north of the Adirondacks, about 18 miles wide. The valley is bounded on the south by the Adirondack Highlands, which rise to heights of from 2,000 to 3,000 feet.

The average annual temperature of the basin is about 45 degrees with extremes of 99° F. and -43°F.

Precipitation averages about 36 inches, with an average annual snowfall of 74 inches at Buffalo. The heaviest precipitation occurs in the Buffalo area from September to February, and in the Canton area from June to October.

Ice forms in Lake Erie, also in some portions of the Niagara River and on the shores of Lake Ontario during the winter months, usually preventing navigation from December to April. Ice jams have frequently occurred in the Niagara River affecting the flow, and have resulted in considerable damage to power plants in the gorge. Due to the fact that an ice barrier formed, the American Falls were completely dried up in the winter of 1935-36.

All the principal streams in the basin are subject to extremes in flow. Heavy rains, melting snow and ice jams bring rapid rises and sometimes serious floods.

The entire area was glaciated and the valley floors are covered by vast deposits of glacial till. In the Finger Lakes region are found large areas of swampy land. In the Lake Ontario Sub-Basin more than two-thirds of the land area is suitable for agricultural use. The upper reaches of the streams, especially in the Adirondack region, are mountainous and wooded with second-growth timber.

One of the outstanding features of this entire region is the many lakes, mountains, and beautiful streams of outstanding recreational and scenic value affording a variety of forms of recreation for the inhabitants and many visitors to the area.

Economic Development

The population of the basin is approximately 2,700,000 based on the preliminary 1950 Census. The population increased approximately 11 percent from 1940 to 1950. There are 19 cities, the largest of which are Buffalo, Rochester, and Syracuse. In addition to the cities, there are 127 communities and institutions having sewer systems. The three largest cities have a total population, based on the 1950 preliminary census, of 1,128,000, approximately 41 percent of the population of the entire basin.

The Buffalo area is highly industrialized because of the availability of cheap hydro-electric power on the Niagara River. Industries manufacture electro-chemical, ferro alloy, abrasive, chlorine, caustic soda, carbide, steel, fertilizer, pulp and paper products. There is also a large production of acids, coke and by-products, dyes, cellulose, rayon, organic chemicals, and petroleum products. In the Rochester area a number of products are manufactured by many specialized industries, some of which dominate in world as well as national markets. Cameras, optical equipment, electrical equipment, scientific equipment, are examples. In the Syracuse area, electrical machinery and equipment, chemicals, machine tools and gears are manufactured. In the St. Lawrence area pulp and paper mills predominate, and zinc is mined. A large hydro-electric aluminum plant is located at Massena.

Dairying is the chief agricultural enterprise and is highly developed. Many milk and milk product plants are found. Fruit growing is also widespread, with apples, peaches, and grapes being the most widely grown. There are many canneries utilizing these products. Some truck farming and poultry raising are carried on to a limited extent, the large urban centers providing ready markets for the produce.

Pollution Contributed to Water Resources

The waters of the Great Lakes-St. Lawrence Basin receive the discharge from 178 municipal sewerage systems which serve a population of over 1,995,000 or nearly 74 percent of the total population of the area. In 104 municipalities serving 89 percent of the sewered population, treatment facilities are provided, however, many of these need improvement.

Industrial wastes are discharged directly to the waterways from 266 sources, of which 77 percent produce organic wastes, and 18 percent produce inorganic wastes. In 13 instances, the type of waste discharged is undetermined. The Buffalo-Niagara Falls area is the principal source of industrial wastes. Many instances of cannery and milk plant wastes are scattered throughout the basin. Paper mill wastes are found principally in the Oswego and St. Lawrence Sub-Basins.

Pollution Prevention Measures in Effect

Sewage treatment facilities are provided for treating the domestic wastes from 104 municipal systems serving a population of approximately 1,784,000. This represents 66 percent of the total population, and about 89 percent of the sewered population in the basin. Of this population more than 1,559,000 are provided with primary treatment and about 225,000 are provided with secondary treatment. No treatment facilities are provided for 11 percent of the total sewered population which contribute pollution from 74 sources.

Industrial waste treatment facilities are provided at 64 establishments, or 24 percent of the sources of industrial pollution. Fifty-two of these are food and kindred products industries. No facilities are provided for 183 industries, and there are 19 establishments in which the facilities were undetermined.

The industrial sources of pollution consist primarily of food and kindred products establishments, and are distributed rather generally throughout the entire basin. Many industries discharge their wastes to municipal sewage treatment plants and therefore do not appear as sources of pollution in this report. Many others do not discharge to municipal treatment works and are sources of pollution, but since complete detailed surveys have not been made, a number of these sources have not been included in this report.

Adequacy of Existing Treatment Facilities

Approximately 59 of the existing municipal treatment facilities, serving 14 percent of the population served by treatment facilities, are adequate in capacity; 44 serving 78 percent are unsatisfactory as to capacity; and 4 serving 8 percent of the population, are undetermined.

Ninety-one treatment facilities serving 96 percent of the population served by treatment works are operated satisfactorily; in only 13 of the facilities is the operation regarded unsatisfactory; and in 3 undetermined.

The adequacy of industrial waste treatment facilities is undetermined at this time, since a detailed survey has not been made to date.

Progress in Pollution Abatement

The progress in sewage treatment plant construction in the basin was relatively slow until after 1925. (See the graph "Growth in Sewage Treatment"). However, the construction trend was greatly accelerated from 1925 to 1940. This progress was due in part to the Federal aid in works relief projects, along with the increased interest of the people in pollution abatement.

The rate of construction illustrates quite significantly the priority status of pollution control projects under wartime and postwar economies during and for several years after World Wars I and II.

An abundant supply of cheap clean water is indispensable to our industry, even more so in times of emergency than in times of peace. Pollution abatement activities must be acknowledged in the allocation of critical materials so that construction of the needed facilities will not be unduly impeded. Water pollution control programs to insure adequate and satisfactory supplies for municipal and industrial uses along with the establishment of emergency water supplies, are of utmost importance in the defense program of the Nation

One municipal sewage treatment plant was built in 1949, serving a population of 25,000. One municipal sewage treatment plant was enlarged in 1948, and another in 1949; the two plants enlarged served a total population of about 77,000.

The New York State Water Pollution Control Act was enacted by the 1949 Legislature and approved by the Governor on April 20, 1949.

Briefly, this law created a water pollution control board within the Department of Health to administer and enforce the provisions of the Act; and required the establishment of water quality standards and classification of the waters of the State in accordance with consideration of best usage in the interest of the public and with regard to recognized engineering and other scientific factors. Under this Act, as soon as the waters of a stream are classified, provisions of the Act apply and all pollution of the water thereof must be abated.

The Department of Health is actively executing the provisions of the law and to date is in the process of establishing stream standards. Surveys are being made for the purpose of classifying the streams, which is prerequisite to actual pollution abatement measures on the waters of the State.

Many communities in the State, due to present constitutional debt limit, can not finance the construction of sewage treatment facilities. A constitutional amendment has been approved by the 1950 Session of the Legislature. It must be approved by the 1951 Legislature, and ratified by the electorate. This amendment provides for the exemption from the debt limits up to 75 percent of the cost of sewer systems and sewage treatment works, if through the use of sewer rentals or similar devices, they can be shown in the blueprint stage to be self-sustaining. It will also substitute the five-year average full valuation for the five-year average assessed valuation as the base for the debt limit. In addition, it revises or reestablishes percentage limitations on the indebtedness of counties, cities, towns, and villages.

Under the Bureau of Municipal Post-War Planning set-up of the State of New York, many communities have secured financial assistance in preparation of plans for pollution abatement projects.

Pollution Prevention Measures Required

New sewage treatment plants are required for 73 municipalities now without treatment facilities, and nine are required to replace existing plants that are now inadequate. These 82 plants serve approximately 13 percent of the sewered population. Thirty-six sewage treatment plants, serving 73 percent of the sewered population, require enlargement or additions to their existing plants.

One hundred-fifty-three industries require new industrial waste treatment facilities and two require new facilities to

Table A. Sources of pollution*, municipal, Great Lakes-St. Lawrence River Basin

Municipalities**	Sources of pollution (in number of municipalities)	Population served by sewerage system	Amount of pollution discharged to watercourse (in terms of equivalent number of people)***
Having data on pollution load discharged to watercourse	--	--	--
Having population data available (Data on pollution load to watercourse incomplete or not available)	178	1,995,579	Not applicable
Total	178	1,995,579	--

*The data appearing in this and the subsequent tables for this sub-basin are summations of readily available information. In some cases the data are incomplete. Further, arrangement of data in these tables is difficult because many municipalities have multiple outlets, many of the existing treatment facilities serve several municipalities, and in some cases several treatment plants serve a single municipality. Accordingly, in comparing the tables minor irregularities may become apparent.

In subsequent reports, these inconsistencies will disappear as field investigations are made and the more complete information is obtained.

**Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

***Includes industrial wastes discharged into municipal sewerage systems.

Table B. Sources of pollution, industrial*, Great Lakes-St. Lawrence River Basin

Industries	Sources of pollution (in number of plants)	Amount of pollution discharged to watercourse (in terms of equivalent number of people)
Producing organic wastes	--	--
Producing organic wastes	216**	Undetermined
Producing inorganic wastes	47	Not applicable
Producing wastes of undetermined type	13	Undetermined
Total	266***	--

*Industries having separate outlets and discharging wastes directly to watercourse.

**Includes 10 plants also producing inorganic wastes.

***Total adjusted to correct for duplication in footnote marked thus**.

replace existing facilities; 40 industries require enlargement or additions to their existing facilities.

Table C. Existing treatment facilities, municipal, Great Lakes-St. Lawrence River Basin

Degree of treatment provided	Number		Population served
	Municipalities*	Plants	
Primary	64	68	1,559,408
Secondary	40	39	224,910
No treatment	74	--	211,261
Total	178	107	1,995,579

*Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

Table D. Existing treatment facilities, industrial*, Great Lakes-St. Lawrence River Basin

Type industry	Number of plants	Number of industrial plants having:		
		Treatment facilities	No treatment facilities	Undetermined facilities
Food and kindred products..	163	52	105	6
Textile mill products......	8	--	7	1
Lumber and wood products...	1	0	1	0
Paper and allied products..	36	1	33	2
Chemical and allied products.....................	17	3	9	15
Products of petroleum and coal.....................	4	1	3	0
Rubber products............	1	0	1	0
Leather and leather products.....................	3	2	1	0
Primary metal..............	5	1	4	0
Fabricated metal...........	6	1	4	1
Miscellaneous..............	21	3	14	4
Mining.....................	1	0	1	0
Total....................	266	64	183	19

*Industries having separate outlets and discharging wastes directly to watercourse.

Table E. Adequacy of existing treatment facilities, Great Lakes-St. Lawrence River Basin

Existing treatment facilities	Number	Adequacy with relation to:					
		Capacity			Operation		
		Satisfactory	Unsatisfactory	Undetermined	Satisfactory	Unsatisfactory	Undetermined
Municipal	107[a]	59[b]	44[c]	4[d]	91[e]	13[f]	3[g]
Industrial	64	0	0	64	0	0	64

[a] Serve a population of 1,784,318.

[b] Serve a population of 247,968.

[c] Serve a population of 1,394,050.

[d] Serve a population of 142,300.

[e] Serve a population of 1,719,868.

[f] Serve a population of 22,150.

[g] Serve a population of 42,300.

Table F. Progress in pollution abatement, Great Lakes-St. Lawrence River Basin

Year	Municipal		Industrial	
	Plants completed	Design population	Plants completed	Amount of waste treated (in terms of equivalent number of people)
1946	--	--	--	--
1947	--	--	--	--
1948	1[a]	2,280	--	--
1949	2[b]	100,000	--	--

[a] Holley, N. Y., plant enlarged.

[b] New plant for Amherst, Mass. (Dist.) to serve 25,000.
Ley Creek plant, Syracuse, N. Y., enlarged to serve 75,000.

Table G. Requirements for municipal and industrial waste treatment plants*, Great Lakes-St. Lawrence River Basin

Requirements	Municipal		Industrial
	Number	Population served by facilities	Number
New plant	73	211,136	153
Enlargement or additions to existing plant	36	1,467,250	40
Replace existing plant	9	36,100	2
No project required	59	278,093	10
Undetermined	1	3,000	61
Total	178	1,995,579	266

*The needs set forth in this table are based on presently available information. However, future studies and evaluations may result in some changes in these needs.

Table H. Status of treatment works project to abate pollution, July 1, 1950, Great Lakes-St. Lawrence River Basin

Status of project	Number	
	Municipal	Industrial
No formal action	68	195
Abatement ordered	--	--
Plans under preparation	11	--
Final plans approved	40	--
Construction awaiting financing	--	--
Under construction	2	--
Status undetermined	--	--

Table I. List of Needed Projects, Sub-Basins of the Great Lakes-St. Lawrence River Basin

Municipalities and industries needing new or improved treatment facilities are tabulated on the following pages. "Municipalities" in the tabulations includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

The list is based upon information readily available pending completion of additional field surveys and investigations by the New York State Water Pollution Control Board. It is admittedly incomplete but is believed to contain most of the significant sources of pollution. Consequently, the requirement "new plant" may upon future investigation indicate connection to city sewers, or other alternate requirements for industries and in some instances for small municipalities or areas contiguous to larger areas having treatment facilities.

Municipalities and industries desiring detailed information on problems affecting them are referred to their State water pollution control agency.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution (July 1, 1950), Lake Erie-Niagara River Sub-Basin

Name	Population served	Project requirements	Remarks
New York -- Municipal:			
Akron	2,300	Enlargement or addition to existing plant.	--
Angola	900	New plant.	--
Attica	1,200	New plant.	--
Batavia	19,500	Replace existing plant.	Final plans approved 6/27/46. Estimated cost $690,000.
Blasdell	1,650	Replace existing plant.	Under construction. Estimated cost $425,000.
Buffalo	617,000	Enlargement or addition to existing plant.	Plans under preparation. Estimated cost $2,100,000.
Cattaraugus	120	New plant.	--
DePew	5,000	New plant.	Final plans approved 7/26/50. Estimated cost $242,000.
Fredonia	5,500	Enlargement or addition to existing plant.	--
Gowanda	2,400	New plant.	Final plans approved 8/15/49. Estimated cost $106,000.
Hamburg	6,000	Enlargement or addition to existing plant.	--
J. N. Adams Memorial Hospital, Perrysburg	500	Replace existing plant.	Final plans being prepared. Estimated cost $160,000.
Lancaster	7,600	Enlargement or addition to existing plant.	Preliminary plans approved 10/15/47. Estimated cost $16,000.
Lewistown	1,618	New plant.	Final plans being prepared. Estimated cost $233,000. Sewers and treatment plant.
Lyth Sanitary District	120	New plant.	

Table I. Project list - municipalities and industries requiring improvement for abatement of pollution (July 1, 1950), Lake Erie-Niagara River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Niagara Falls	100,000	Enlargement or addition to existing plant.	--
North Collins	1,000	Enlargement or addition to existing plant.	--
North Tonawanda	20,000	New plant.	Preliminary plans prepared. Estimated cost $544,000.
Silver Creek	2,700	New plant.	--
Springville	3,000	New plant.	Final plans approved 2/11/42. Estimated cost $150,000.
Wanakah Sanitary District	450	Enlargement or addition to existing plant.	--
West Seneca Sanitary District No. 5	15,000	Enlargement or addition to existing plant.	--
West Seneca Sanitary District No. 6	500	Enlargement or addition to existing plant.	--
New York -- Industrial:			
Allegheny-Ludlum-Steel Corp., Dunkirk	--	New plant.	--
Bedford Products Co., Dunkirk	--	New plant.	--
Bethlehem Steel Co., Lackawanna	--	New plant.	--
Bison Canning Co., Angola	--	New plant.	--
Borden Co., Arcade	--	New plant.	--
Bordens, Inc., Delevan	--	New plant.	--
Bordens, Inc., West Valley	--	New plant.	--
Brocton Preserving Co., Brocton	--	New plant.	--
Buffalo Electro-Chemical Co., Tonawanda	--	New plant.	--
Buffalo Flour Mills, Buffalo	--	New plant.	--
Chevrolet Motor and Axle Plant No. 1, Tonawanda	--	New plant.	--
Cooperative G.L.F., Buffalo	--	New plant.	--
Dellwood Elevator, Buffalo	--	New plant.	--
Donner-Hanna Coke Co., Buffalo	--	Enlargement or addition to existing plant.	--
Dunlop Tire and Rubber Co., Tonawanda Township	--	New plant.	--
Dupont Industries, Tonawanda Township	--	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution (July 1, 1950), Lake Erie-Niagara River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Electric Refractories and Alloys Corp., Hamburg	--	New plant.	--
Frontier Fuel Refining Co., Buffalo	--	New plant.	--
General Chemical Co., Buffalo	--	New plant.	--
Great Lakes Preserving Corp., Farnham	--	New plant.	--
S. Howe Co., Silver Creek	--	New plant.	--
International Paper Co., Niagara Falls	--	New plant.	--
Huron Portland Cement Co., Buffalo	--	New plant.	--
Lawton Canning Co., Lawton	--	Enlargement or addition to existing plant.	--
Lake and Rail Elevator, Buffalo	--	New plant.	--
Madison Wire Co., W. Seneca Township	--	New plant.	--
McAteer Canning Co., Ripley	--	New plant.	--
Mohawk Milk Products, Co., Cattaraugus	--	New plant.	--
Morgan Canning Co., Forestville	--	New plant.	--
Oakes and Burger Co., Cattaraugus	--	New plant.	--
Onley-Carpenter Eden	--	Enlargement or addition to existing plant.	--
Pevot Malting Co., Buffalo	--	New plant.	--
Quimley Dairy, Inc., Hamburg	--	New plant.	--
Seequerts Dairy, Silver Creek	--	New plant.	--
Setter Brothers, Cattaraugus	--	New plant.	--
Silver Creek Precision Co., Silver Creek	--	New plant.	--
Silver Creek Preserving Co., Silver Creek	--	Enlargement or addition to existing plant.	--
Weavers Dairy Cattaraugus Co.	--	New plant.	--
Welch Grape Juice Co., Brocton	--	New plant.	--
Welch Grape Juice Co., Silver Creek	--	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution (July 1, 1950), Lake Ontario Sub-Basin

Name	Population served	Project requirements	Remarks
New York -- Municipal:			
Adams	1,743	New plant.	Plans complete. Estimated cost $213,000. Sewers and treatment plant.
Albion	5,500	Enlargement or addition to existing plant.	Final plans approved 8/25/47. Estimated cost cost $17,000.
Barker	300	New plant.	--
Boonville	2,000	Enlargement or addition to existing plant.	--
Brightontown (Allen Cr.)	12,000	Enlargement or addition to existing plant.	--
Brockport Village	3,700	Enlargement or addition to existing plant.	Final plans approved 4/4/50. Estimated cost $81,000.
Brownville	750	New plant.	--
Carthage	3,000	New plant.	Final plans approved 12/31/46. Estimated cost $255,000.
Clyde	2,128	New plant.	Final plans underway. Estimated cost $293,000. Sewers and treatment plant.
Croghan	370	New plant.	--
East Rochester	7,500	Enlargement or addition to existing plant.	--
Fairport Village	4,500	Enlargement or addition to existing plant.	--
Glenfield	300	New plant.	--
Holley	1,550	Enlargement or addition to existing plant.	Final plans approved 3/29/49. Estimated cost $60,000.
Lyons Falls	854	New plant.	Plans complete. Estimated cost $114,000. Sewers and treatment plant.
Medina	6,500	New plant.	Final plans approved 8/4/41. Estimated cost $194,000.
Middleport	1,550	Replace existing plant.	--
Olcott Sanitary District	772	New plant.	Plans complete. Estimated cost $225,000. Sewers and treatment plant.
Oswego City (East Side)	11,000	New plant.	Final plans approved 5/23/44. Estimated cost $208,000.
Parish Village	150	New plant.	--
Pulaski	400	New plant.	Final plans approved 10/30/45. Estimated cost $283,000.
Rochester - Main Plant	318,000	Enlargement or addition to existing plant.	--

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution (July 1, 1950), Lake Ontario Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Rochester - University Plant..........	2,300	Replace existing plant.	Final plans approved 7/21/49. Estimated cost $53,000.
Rochester - Tyron Park Plant..........	20,000	Enlargement or addition to existing plant.	--
Sodus........................	1,584	New plant.	Plans complete. Estimated cost $207,000. Sewers and treatment plant.
Watertown...................	35,000	New plant.	Preliminary plans approved 9/24/47. Estimated cost $485,000.
West Carthage...............	1,500	New plant.	--
Wilson......................	900	Replace existing plant.	Plans complete. Estimated cost $44,400
Wolcott Village	200	New plant.	--
New York -- Industrial:			
Arnstein and Bockman, Oliver....................	--	New plant.	--
Borden Milk Co., Castorland................	--	New plant.	--
Brownville Board Co., Brownville................	--	New plant.	--
Brown Creamery, Lycoming..................	--	Enlargement or addition to existing plant.	Lagoon.
Carthage Paper Makers Inc., Carthage..................	--	New plant.	--
Champion Paper Co., West Carthage.............	--	New plant.	--
Clapp, Harold H., Inc., Burt......................	--	New plant.	--
Climax Manufacturing Co., West Carthage.............	--	New plant.	--
Colosse, Chase and Butler Co., Colosse..............	--	New plant.	--
Continental Food Co., Albion....................	--	Enlargement or addition to existing plant.	--
Dairymen's League, Adams.....................	--	New plant.	--
Dairymen's League, Mexico....................	--	New plant.	--
Dexter Sulphite Co., Dexter....................	--	New plant.	--
Duffy Mott, Hamlin....................	--	New plant.	--
Empire State Pickling Co., Carlton..................	--	Enlargement or addition to existing plant.	--
Flintcote Co., Lockport.................	--	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution (July 1, 1950), Lake Ontario Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Friends Packing Co., Albion	--	Enlargement or addition to existing plant.	--
Gould Paper Co., Lyons Falls	--	New plant.	--
George H. Haxton Co., Barker	--	Enlargement or addition to existing plant.	--
Hoffman and Dudo, Deer River	--	New plant.	--
Jersey Milk and Cream Co., La Forgeville	--	New plant.	--
J. B. LeFrois, Webster	--	Enlargement or addition to existing plant.	Screens.
J. P. Lewis, Beaver Falls	--	New plant.	--
Lockport Felt Co., Newfane	--	New plant.	--
Lydonville Canning Co., Lydonville	--	New plant.	--
Morton Canning Co., Morton	--	New plant.	--
Moyer and Pratt, Lydonville	--	New plant.	--
New York Frozen Foods, Hamlin	--	Enlargement or addition to existing plant.	Screens and lagoons.
Niagara County Preserving Co., Wilson	--	Enlargement or addition to existing plant.	--
Northern Milk Co., Adams	--	New plant.	--
Orleans Canning Co., Barre Center	--	Enlargement or addition to existing plant.	Septic tank.
Purity Creamery Products, Lacona	--	New plant.	--
Queens Farm Dairy, Copenhagen	--	New plant.	--
Rock Garden Cheese Factory, Victory	--	New plant.	--
Roop Milk Products, Mexico	--	New plant.	--
Sardik Food Products Co., Lockport	--	New plant.	--
Sheffield Farms, Limerick	--	New plant.	--
Sheffield Farms, Pulaski	--	New plant.	--
Sodus Canning Co., Sodus	--	Enlargement or addition to existing plant.	Screens and settling tank.
Sodus Creamery, Sodus	--	New plant.	--
Speas Co., Lydonville	--	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution (July 1, 1950), Lake Ontario Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
St. Regis Paper Co., Deferiet..................	--	New plant.	--
Taggart Brothers, Herring....................	--	New plant.	--
United Paper Board Co., Lockport..................	--	New plant.	--
Victor Preserving Co., Ontario Center............	--	New plant.	--
Webster Canning Co., Webster...................	--	Enlargement or addition to existing plant.	Screens and settling tank.
Genesee River Sub-Basin			
New York -- Municipal:			
Avon.........................	1,700	Replace exising plant.	--
Castile......................	1,059	New plant.	Plans complete. Estimated cost $210,000. Sewer.
Gates........................	799	New plant.	Preliminary plans complete. Estimated cost $380,000. Sewers and treatment plant.
Geneseo......................	2,100	New plant.	Final plans approved 7/29/36. Estimated cost $30,000.
Houghton.....................	600	Enlargement or addition to existing plant.	--
LeRoy........................	3,500	New plant.	Final plans approved 2/26/47. Estimated cost $475,000.
Mount Morris.................	3,300	Enlargement or addition to existing plant.	Final plans completed. Estimated cost $85,000.
Perry........................	5,000	New plant.	Final plans approved 7/2/46. Estimated cost $93,000.
Rochester (Charlotte Plant).........	7,000	Enlargement or addition to existing plant.	--
Scottsville..................	1,000	Enlargement or addition to existing plant.	--
Stutson......................	2,500	Enlargement or addition to existing plant.	--
Summerville..................	3,500	Enlargement or addition to existing plant.	--
New York -- Industrial:			
Birds Eye-Snider Packing Co., Avon.................	--	Enlargement or addition to existing plant.	--
Birds Eye-Snider Packing Co., Geneseo..............	--	Enlargement or addition to existing plant.	--
Birds Eye-Snider Packing Co., Mount Morris.........	--	Enlargement or addition to existing plant.	--
Black Creek Cheese Co., Black Creek...............	--	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution (July 1, 1950), Genesee River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Borden Co., Belmont	--	New plant.	--
Borden Co., Whitesville	--	Enlargement or addition to existing plant.	--
Borden Co., Fillmore	--	New plant.	--
Breger Ice Cream Co., Houghton	--	Enlargement or addition to existing plant.	--
Cuba Cheese and Trading Co., Centerville	--	New plant.	--
Cunesus Co-op., Nunda Creamery, Nunda	--	Enlargement or addition to existing plant.	--
Cunesus Co-op., Grand View Dairy, Springwater	--	New plant.	--
Curtice Can Co., Bergen	--	New plant.	--
Curtice Can Co., Mount Morris	--	Enlargement or addition to existing plant.	--
Dairymen's League Co-op., Andover	--	New plant.	--
Dairymen's League Groveland Creamery, Groveland Station	--	New plant.	--
Genesee Valley Cheese Factory, Cuba Cheese and Trading Co., Rossburg in Hume	--	New plant.	--
Hallsport Cheese Factory,, Cuba Cheese and Trading Co., Wellsville	--	New plant.	--
Haxton Can Co., LeRoy	--	Enlargement or addition to existing plant.	--
Haxton Canning Co., Wyoming	--	Enlargement or addition to existing plant.	--
Honeoye Falls Cream Products, Honeoye Falls	--	Enlargement or addition to existing plant.	--
Fred W. James, W. Br. Cheese Factory, Rushford	--	New plant.	--
Jello Co., LeRoy	--	New plant.	--
Lakeville Creamery, Livonia	--	Enlargement or addition to existing plant.	--
Lapp Insulator Co., LeRoy	--	Replace existing plant.	--
Paper Mill, Dansville	--	New plant.	--
Pike Centennial Co., Pike	--	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution (July 1, 1950), Genesee River Sub-Basin--Continued

Name	Population served *	Project requirements	Remarks
Sinclair Refining Co., Wellsville	--	Enlargement or addition to existing plant.	--
Spring Valley Cheese Factory, Cuba Cheese & Trading Co., Black Creek	--	New plant.	--
Standard Brewing Co., Rochester	--	New plant.	--
Sunnydale Farms Inc., Andover	--	New plant.	--
Wm. Woodruff, White Creek Cheese Ftry., Friendship	--	New plant.	
Oswego River Sub-Basin			
New York -- Municipal:			
Auburn	38,000	Enlargement or addition to existing plant.	--
Camden	2,000	Enlargement or addition to existing plant.	--
Camillus	1,100	Enlargement or addition to existing plant.	--
Canandaigua	7,200	Enlargement or addition to existing plant.	--
Canastota	4,200	New plant.	Final plans approved 1/10/46. Estimated cost $68,000.
Cazenovia	1,700	New plant.	Final plans approved 11/7/46. Estimated cost $51,000.
Clyde	2,000	Replace existing plant.	--
Dundee	1,150	Enlargement or addition to existing plant.	--
Fayetteville	2,647	New plant.	Plans complete. Estimated cost $481,000. Sewers and treatment plant.
Fulton City	12,462	New plant.	--
Geneva	20,000	Enlargement or addition to existing plant.	Final plans approved 12/19/49. Estimated cost $66,000.
Jordan	1,283	New plant.	Plans complete. Estimated cost $217,000. Sewers and treatment plant.
Manlius (Village)	1,736	New plant.	Plans complete. Estimated cost $168,000. Sewers and treatment plant.
Manlius School	300	New plant.	--
Montour Falls	1,458	New plant and sewer system.	Final plans complete. Estimated cost $229,000.
Newark	9,000	Enlargement or addition to existing plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution (July 1, 1950), Oswego River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Oneida	10,300	Enlargement or addition to existing plant.	Final plans approved 2/19/47. Estimated cost $185,000.
Oneida Castle	556	New plant.	Plans complete. Estimated cost $78,000. Sewers and treatment plant.
Ovid	578	New plant.	Plans complete. Estimated cost $118,000. Sewers and treatment plant.
Palmyra	500	New plant.	Plans complete. Estimated cost $392,000. Sewers and treatment plant.
Phoenix	1.700	New plant.	--
Seneca Falls	6,000	Replace existing plant.	Final plans approved 6/20/49. Estimated cost $289,000.
Sherrill	1,200	New plant.	--
Solvay	8,334	New plant.	Final plans approved 2/9/32. Estimated cost $50,000.
Syracuse	225,000	Enlargement or addition to existing plant.	Preliminary report completed. Estimated cost $8,728,000.
Union Springs	905	New plant.	Plans complete. Estimated cost $151,000. Sewers and treatment plant.
Vernon	587	New plant.	Under construction. Estimated cost $91,000. Sewers and treatment plant.
Victor	1,068	New plant.	Plans complete. Estimated cost $170,000. Sewers and treatment plant.
Waterloo	4,000	Enlargement or addition to existing plant.	--
New York -- Industrial:			
American Can Co., Geneva	--	New plant.	--
American Woolen Co., Fulton	--	New plant.	--
Andres Range Corp., Geneva	--	New plant.	--
Best Ice Cream Co., Skaneateles	--	New plant.	--
Block and Guggenheimer, Seneca Castle	--	New plant.	--
Borden Co., Pennelville	--	New plant.	--
Bordens Milk Co., Moravia	--	Enlargement or addition to existing plant.	--
Camden Wire Co., Camden	--	New plant.	--
Comstock Can Co., Marion	--	Enlargement or addition to existing plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I./Project list - municipalities and industries requiring improvements for abatement of pollution (July 1, 1950), Oswego River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Crucible Steel Co., Geddes....................	--	New plant	--
Dairymen's League, Cazenovia (Rippleton Pl.) Rippleton.................	--	New plant.	--
Dairymen's League, Chittenango Station Place, Chittenango Station.......	--	New plant.	--
Dairymen's League, New Woodstock Place, New Woodstock.............	--	New plant.	--
Dairymen's League, Vernon Plant, Vernon....................	--	Enlargement or addition to existing plant.	--
Dairymen's League Co-op, Cato.....................	--	New plant.	--
Driscoll Trucking Co., Geneva.....................	--	New plant.	--
Eastern Farm Products, Co., Sherrill.............	--	Enlargement or addition to existing plant.	--
Empire State Can Co., Verona....................	--	Enlargement or addition to existing plant.	--
Finger Lakes Creamery, Union Springs.............	--	New plant.	--
G.L.F. Canning, Macedon...................	--	New plant.	--
Garlock Packing Co., Palmyra...................	--	New plant.	--
General Foods, Inc., Fulton City...............	--	Enlargement or addition to existing plant.	--
Genoa Cheese Factory, Genoa.....................	--	New plant.	--
Glen Side, Glenside..................	--	New plant.	--
Hill Brothers, Lyons.....................	--	New plant.	--
Kraft's Food Co , Churchville Place, Churchville...............	--	New plant.	--
Kraft's Foods Co., New London Place, New London................	--	New plant.	--
Mallory Milk Products, Co-op., Mallory Station...	--	New plant.	--
McIntire Brothers Paper Co., Fayetteville.........	--	New plant.	--
W. E. McIntosh Co., Geneva....................	--	Enlargement or addition to existing plant.	--
Modern Tissue Corporation, Amboy Station............	--	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution (July 1, 1950), Oswego River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Mueller Dairies, Inc., Kenwood Plant, Kenwood	--	New plant.	--
Mueller Dairies, Inc., Munnsville Plant, Munnsville	--	Enlargement or addition to existing plant.	--
Nelson Creamery Corporation, Nelson	--	New plant.	--
N.Y.C. R.R. Shops, East Syracuse	--	New plant.	--
North End Paper Mill, Fulton City	--	New plant.	--
Olney and Floyd, Inc., (Can.), Lee Center	--	New plant.	--
Oneida Limited, (Silver Plate), Sherrill	--	Replace existing plant.	--
Oswego Falls Corporation, Fulton City,	--	New plant.	--
Oswego River Paper Co., West Phoenix	--	New plant.	--
P and K Dairy Co., West Lee Plant, West Lee	--	Enlargement or addition to existing plant.	--
Patent Cereal Co., Geneva	--	New plant.	--
Peter-Cailler-Kohler Co., Fulton City	--	Enlargement or addition to existing plant.	--
Phelps Canning Co., North Bay	--	New plant.	--
Queensboro Farm Products, Blossvale	--	New plant.	--
Read Paper Co., Ithaca	--	New plant.	--
Reid's Union Dairy Co., Oneida Plant, Oneida	--	New plant.	--
John Reinhardt Cheese Factory, Lee Center	--	New plant.	--
River Valley Paper Co., W. Phoenix	--	New plant.	--
J. E. Rosasco Creameries, Westdale Plant, Westdale	--	New plant.	--
Schuler Potato Chip Co., Cato	--	Enlargement or addition to existing plant.	--
Seneca Knitting Mills, Seneca Falls	--	New plant.	--
Senaso Paper Co., Phoenix	--	New plant.	--
Sheffield Farms, Moravia	--	Enlargement or addition to existing plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution (July 1, 1950), Oswego River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Shuron Optical Co., Geneva	--	New plant.	--
Skaneateles Farm Products, Harlot	--	New plant.	--
Stewart-Hartshone Co., Oswego City	--	New plant.	--
Sweet Brothers, Paper Company, Phoenix	--	New plant.	--
Taberg Cheese Place, Taberg	--	New plant.	--
Velvet Tissue Paper Co., Fulton City	--	New plant.	--
Victoria Paper Mills, Fulton City	--	New plant.	--
Volney Felt Mills, Fulton City	--	New plant.	--
Waterbury Felt Co., Mottville	--	New plant.	--
Whitehouse Milk and Cream Co., Bingley Plant, Bingley	--	New plant.	--
Wood Paper Mill, West Phoenix	--	New plant.	--
Yost-Woener, (Liverpool Road,) Liverpool Road	--	New plant.	--
Saint Lawrence River Sub-Basin			
New York -- Municipal:			
Alexandria Bay	1,800	New plant.	--
Cape Vincent	930	New plant.	--
Clayton	1,500	New plant.	--
Chateaugay	1,200	New plant.	Final plans approved 5/29/47. Estimated cost $69,685.
Conifer	200	New plant.	--
Edwards	400	New plant.	--
Gouverneur	3,000	New plant.	--
Herman	500	New plant.	--
Heuvelton	500	New plant.	--
Massena	11,300	New plant.	Preliminary plans approved 5/2/46.
Morristown	700	New plant.	--
Norwood	950	New plant.	--
Ogdensburg	16,000	New plant.	Final plans approved 10/9/44. Estimated cost $277,700.
Philadelphia	600	New plant.	--
Potsdam	4,800	New plant.	Final plans approved 9/24/48. Estimated cost $198,000.
Raquette Lake	150	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution (July 1, 1950), Saint Lawrence River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Sunmount Hospital, U.S. Veterans Administration	720	Additions to or enlargement of existing facilities.	--
Theresa	350	New plant.	--
Thousand Island Park	3,000	New plant.	--
Saint Lawrence State Hospital, Ogdensburg	--	New plant.	Estimated cost $600,000.
Tupper Lake	1,800	New plant.	Preliminary plans approved 12/17/41. Estimated cost $108,000.
Unionville	200	New plant.	--
Waddington	500	New plant.	--
Wanakena	125	New plant.	--
New York -- Industrial:			
Aiello Brothers, Heuvelton	--	New plant.	--
Borden Cheese Co., Antwerp	--	New plant.	--
Dairymen's League, Heuvelton	--	New plant.	--
Dairymen's League, Winthrop	--	New plant.	--
DeKalb Creameries, East DeKalb	--	New plant.	--
Edwards Dairy Co., Edwards	--	New plant.	--
General Ice Cream Corporation, North Lawrence	--	Enlargement or addition to existing plant.	--
Republic Steel Corporation, Lyon Mountain	--	Enlargement or addition to existing plant.	--
Sheffield Farms, Douglas Crossing	--	New plant.	--
Sheffield Farms, Heuvelton	--	New plant.	--
Saint Lawrence Co., Co-op., Dairy, Norfold	--	New plant.	--
Waddington Milk Co., Waddington	--	New plant.	--
Western Condensing Co., Heuvelton	--	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

HUDSON RIVER BASIN

Sub-Basins { Mohawk River
Upper Hudson River
Lower Hudson River*

General Description

For the purposes of this report, the Hudson River Basin consists of the Mohawk River Sub-Basin; the Upper Hudson River Sub-Basin, and the Lower Hudson River Sub-Basin* to the Northern Boundary of Westchester County, New York. The total area of the drainage basin to the north line of Westchester and Rockland Counties is approximately 12,700 square miles. Its length is approximately 250 miles and average width 50 miles.

Frequently called the "Rhine of America," its beauty, historic interest, and commercial value have made the Hudson one of the most important rivers in the United States. It is 300 miles in length, lying almost entirely in New York State.

From Lake Tear-of-the-Clouds, lying on the southwest slope of Mt. Marcy (elevation 5,344 feet) the highest peak of the Adirondack range, at an elevation of about 4,300 feet, the Hudson River rises as a turbulent mountain stream flowing with rapid descent through the rugged terrain of the Adirondacks in a general southerly direction to the junction with the Mohawk at Waterford, two and one half miles above the Federal Lock and Navigation Dam at Troy.

This portion of the river drains a total area of 4,620 square miles; 3,952 are within the State of New York, 551 in Vermont, and 164 in Massachusetts. About 69 percent of the New York area lies within the Adirondack State Park.

The upper regions forming the southeasterly slopes of the Adirondack Chain are mountainous in character, generally heavily wooded with numerous lakes and ponds of which the largest are Indian Lake, Schroon Lake, and Sacandaga Reservoir. Many of the lakes are controlled by outlet works for regulation of flood flows, which are also of use in regulating flows.

From the dam at Troy the river flows approximately 100 miles with a drainage area of 4,568 square miles, which excludes the area below the northern line of Westchester County. The easterly boundary of the basin follows closely the New York - Massachusetts boundary, with less than one percent of the basin in Massachusetts. The westerly limit is an irregular line following the heights of the Catskill Mountains and the Shawagunk range.

The Lower Hudson is tidal to Troy Dam. In this area it receives the combined flows of the Mohawk, its largest tributary, and Upper Hudson Rivers. Floods have occurred in the Albany-Troy area and will undoubtedly occur in the future, due to the unfavorable characteristics of the natural synchronization of the flood peaks of the Mohawk and Upper Hudson at their junction. Existing control works and river improvements have exercised a marked moderating influence on these conditions in recent years.

Within the area is found a wide variety of climate, ranging from the moderate climate of the Lower Hudson through the continental type over the uplands, to the rigorous climate of the Adirondack Mountains in the Upper Hudson. The average annual temperature ranges from about 40°F. over the Adirondack-Upper Hudson region, to about 50°F. over the Lower Hudson. Temperatures as high as 100°F. and and low as -50° F. have been recorded in the Upper Hudson. However, this area is noted for its pleasantly warm days and cool nights in summer, which have contributed to a great extent its wide use as a recreational area. Temperatures in the Mohawk River Sub-Basin vary from a mean annual temperature of 48°F. at Albany to 45°F. at Utica. In the Lower Hudson the mean annual temperature varies from 52°F. at the extreme southern portion to 48°F. at Albany. Temperatures of 104°F. and -24°F. have been recorded there. The precipitation over the entire basin varies from 35 inches in the Albany area, to from 45 to 50 inches in the Upper and Lower Hudson areas. The average snowfall varies from 32 inches in the southern area to 50 inches at Albany and 88 inches in the Adirondacks.

Economic Development

The population according to the preliminary 1950 Census figures was approximately 1,620,000, equivalent to 130 per square mile, with the Mohawk Valley the most densely populated area. There are 22 cities located in the basin with an estimated population of 820,000.

The paper mill industries predominate in the upper Hudson Valley. The Mohawk is primarily an industrial area, producing a great variety of products including machinery, locomotives, carpets, textiles, leather, gloves, clothing, paper, furniture, and other wood products. Rome leads the country in the manufacture of copper products. In the Lower Hudson the textile industry centers around Troy, and many small industries are located in Albany. The cement industry has large plants at Hudson and Catskill, and brick and terra cotta products are manufactured at numerous places along the river. The Hudson Valley is the largest producers of common brick in the world.

Dairying is the chief agricultural enterprise and is highly developed. Many milk and milk products plants are found in the basin, and fruit and truck farming are carried on to a lesser degree. Farm produce raised are readily disposed of in the populus centers in the basin and the New York Metropolitan Area. Milk and dairy products are shipped by truck and railroads to the New York Metropolitan Area which provides ready markets for it.

Recreation is highly developed in the basin, especially in the Upper Hudson where the principal occupation of the inhabitants is catering to the needs of tourists and vacationists. Many State Parks are located within the basin, the largest of which are Palisades Interstate Park, Catskill State Park, and Taconic State Park in the Lower Hudson River area, and Adirondack State Park in the Upper Hudson River. Sport fishing is extremely popular in the mountain streams.

The Lower Hudson provides a deep water channel for ocean going vessels as far as Albany. The river is navigable to North Germantown the year round. Any ice forming is broken by passing boats. Above this point U. S. Coast Guard icebreakers maintain an open channel to Albany throughout the winter for essential navigation. The New York State Barge Canal and the Champlain Canal are usually navigable from April to November.

Pollution Contributed to Water Resources

The streams of the Hudson River Basin receive pollution from 150 municipal sources serving a population of 1,074,745 or about 65 percent of the total population of the area.

Industrial wastes are discharged directly to the waters from 173 sources of which 137 produce organic wastes and 47 produce inorganic wastes.

Pollution Prevention Measures in Effect

Sewage treatment facilities are provided for treating the domestic wastes from 90 municipal sources serving a population of approximately 588,000 representing 36 percent of the total population and about 55 percent of the sewered population. About 410,000 people are provided with primary treatment and 179,000 with secondary treatment. No treatment facilities are provided for 45 percent of the sewered population which contribute to 60 sources of pollution.

Industrial waste treatment facilities are provided for 30 of the 173 sources of industrial waste pollution. Fifteen of these are located at food and kindred products establishments. No facilities are provided for 139 establishments, and there are four establishments in which facilities are undetermined.

The industrial sources of pollution consist primarily of food and kindred products, textile mill and paper mill establishments. These are distributed rather generally throughout the basin. Many industries discharge their wastes to municipal sewage treatment plants, especially in the Gloversville and Johnstown areas, and in the Albany-Schenectady-Troy, and the Rome-Utica metropolitan areas, and therefore do not appear as sources of pollution in this report. There are undoubtedly many others that do not discharge to municipal facilities and are sources of pollution, but since detailed surveys have not been made these sources have not been included.

Adequacy of Existing Treatment Facilities

Fifty-eight of the existing municipal treatment facilities, serving 44 percent of the population served by treatment facilities, are adequate in capacity; 21 serving 50 percent are unsatisfactory; and 13 serving 6 percent are undetermined. Seventy-two treatment facilities serving 60 percent of the population were operated satisfactorily, seven of the facilities serving 35 percent of the population were unsatisfactory in operation, and in 13 the adequacy of operation was undetermined.

Of 30 industrial waste treatment facilities, five were satisfactory as to capacity, 21 were unsatisfactory, and four were undetermined. In adequacy as pertains to operation, 11 were satisfactory, three were unsatisfactory, and for 16, were undetermined.

Progress in Pollution Abatement

The progress in sewage treatment plant construction in the basin was relatively slow until after 1925. Construction was greatly accelerated from 1925 through 1940. This progress was due in part to the Federal aid in works relief projects along with the increased interest of the people in pollution abatement.

Recent progress in construction of pollution abatement facilities has also been very slow in the Hudson Basin. In 1947, Kingston completed a plant to serve 30,000, and in 1949 Woodridge enlarged its plant to serve 3,000. Recent legislative acts of New York, implementing its pollution control work is discussed in the summary of the Great Lakes–St. Lawrence Basin.

Pollution Prevention Measures Required

New sewage treatment plants are needed for 57 municipalities now without treatment facilities, and four are needed to replace existing plants that are now inadequate. These 61 plants will serve approximately 44 percent of the sewered population. Twenty-six sewage treatment plants serving 33 percent of the sewered population need enlargement or additions.

Table A. Sources of pollution*, municipal, Hudson River Basin

Municipalities**	Sources of pollution (in number of municipalities)	Population served by sewerage system	Amount of pollution discharged to watercourse (in terms of equivalent number of people)***
Having data on pollution load discharged to watercourse	23	110,998	103,851
Having population data available (Data on pollution load to watercourse incomplete or not available)	127	963,747	Not applicable
Total	150	1,074,745	--

*The data appearing in this and the subsequent tables for this sub-basin are summations of readily available information. In some cases the data are incomplete. Further, arrangement of data in these tables is difficult because many municipalities have multiple outlets, many of the existing treatment facilities serve several municipalities, and in some cases several treatment plants serve a single municipality. Accordingly, in comparing the tables minor irregularities may become apparent.

In subsequent reports, these inconsistencies will disappear as field investigations are made and the more complete information is obtained.

**Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns, significant institutions, reports, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

***Includes industrial wastes discharged into municipal sewerage systems.

Industrial requirements show the need for 149 new plants, six replacements of existing plants, and 11 plants need enlargements or additions.

Table B. Sources of pollution, industrial*, Hudson River Basin

Industries	Sources of pollution (in number of plants)	Amount of pollution discharged to watercourse (in terms of equivalent number of people)
Producing organic wastes	25 [a]	27,374
Producing organic wastes	112 [b]	Undetermined
Producing inorganic wastes	47	Not applicable
Producing wastes of undetermined type	2	Undetermined
Total	173	--

*Industries having separate outlets and discharging wastes directly to watercourse.

a Includes 1 plant also producing inorganic wastes.

b Includes 12 plants also producing inorganic wastes.

c Total adjusted to correct for duplication noted in (a) and (b).

Table C. Existing treatment facilities, municipal, Hudson River Basin

Degree of treatment provided	Number		Population served
	Municipalities*	Plants	
Primary	62	65	409,670
Secondary	28	28	178,625
No treatment	60	0	486,450
Total	150	93	1,074,745

*Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

Table D. Existing treatment facilities, industrial*, Hudson River Basin

Type industry	Number of plants	Number of industrial plants having:		
		Treatment facilities	No treatment facilities	Undetermined facilities
Food and kindred products..	61	15	45	1
Textile mill products......	38	1	35	2
Paper and allied products..	34	2	31	1
Chemical and allied products....................	7	4	3	0
Leather and leather products....................	3	1	2	0
Primary metal products.....	6	1	5	0
Fabricated metal products..	4	0	4	0
Mining.....................	3	3	0	0
Miscellaneous..............	17	3	14	0
Total....................	173	30	139	4

*Industries having separate outlets and discharging wastes directly to watercourse.

Table E. Adequacy of existing treatment facilities, Hudson River Basin

Existing treatment facilities	Number	Adequacy with relation to:					
		Capacity			Operation		
		Satisfactory	Unsatisfactory	Undetermined	Satisfactory	Unsatisfactory	Undetermined
Municipal	93[a]	58[b]	21[c]	14[d]	72[e]	7[f]	13[g]
Industrial	30	5	21	4	11	3	16

[a] Serve a population of 588,295.

[b] Serve a population of 257,335.

[c] Serve a population of 296,800.

[d] Serve a population of 34,160.

[e] Serve a population of 351,245.

[f] Serve a population of 206,550.

[g] Serve a population of 30,500.

Table F. Progress in pollution abatement, Hudson River Basin

Year	Municipal		Industrial	
	Plants completed	Design population	Plants completed	Amount of waste treated (in terms of equivalent number of people)
1946	—	—	—	—
1947	1	30,000	—	—
1948	—	—	—	—
1949	1	3,000	—	—

Table G. Requirements for municipal and industrial waste treatment plants*, Hudson River Basin

Requirements	Municipal		Industrial
	Number	Population served by facilities	Number
New plant	57	473,100	149
Enlargement or additions to existing plant	26	352,270	11
Replace existing plant	4	8,800	6
No project required	63	240,575	6
Undetermined	--	--	1
Total	150	1,074,745	173

*The needs set forth in this table are based on presently available information. However, future studies and evaluations may result in some changes in these needs.

Table H. Status of treatment works projects to abate pollution, July 1, 1950, Hudson River Basin

Status of project	Number	
	Municipal	Industrial
No formal action	47	162*
Abatement ordered	--	--
Plans under preparation	9	1
Final plans approved	31	2
Construction awaiting financing	--	--
Under construction	--	--
Status undetermined	--	--

*No detailed survey data available.

Table I. List of Needed Projects, Sub-Basins of the Hudson River Basin

Municipalities and industries needing new or improved treatment facilities are tabulated on the following pages. "Municipalities" in the tabulations includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to water course.

The list is based upon information readily available pending completion of additional field surveys and investigations by the New York State Water Pollution Control Board. It is admittedly incomplete but is believed to contain most of the significant sources of pollution. Consequently, the requirement "new plant" may upon future investigation indicate connection to city sewers, or other alternate requirements for industries and in some instances for small municipalities or areas contiguous to larger areas having treatment facilities.

Municipalities and industries desiring detailed information on problems affecting them are referred to their State water pollution control agency.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Mohawk River Sub-Basin

Name	Population served	Project requirements	Remarks
New York--Municipal:			
Amsterdam	33,300	New plant.	Final plans approved 3/15/50. Estimated cost $937,000.
Canajoharie	2,600	Enlargement or addition to existing plant.	Final plans approved 3/10/49. Estimated cost $60,000.
Cohoes	20,000	New plant.	Final plans approved 7/12/38. Estimated cost $303,000.
Dolgeville	3,500	Enlargement or addition to existing plant.	--
Fonda	1,000	New plant.	--
Fort Plain	2,800	New plant.	--
Fultonville	800	Enlargement or addition to existing plant.	--
Gloversville	23,000	Enlargement or addition to existing plant.	Final plans approved 4/21/50. Estimated cost $528,000.
Hamilton College Sewer District	--	Enlargement or addition to existing plant.	Plans completed. Estimated cost $124,000.
Herkimer County Home	--	New plant.	--
Johnstown	10,000	New plant.	--
Little Falls	11,000	New plant.	Final plans approved 1/10/46. Estimated cost $185,000.
Nelliston	600	New plant.	Final plans approved 3/1/26.
New Hartford	1,950	Enlargement or addition to existing plant.	--
New York Mills	4,000	Enlargement or addition to existing plant.	--
Palatine Bridge	500	Enlargement or addition to existing plant.	--
St. Johnsville	2,300	New plant.	--
Schenectady	86,000	Enlargement or addition to existing plant.	Final plans approved 8/27/48. Estimated cost $1,300,000.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Mohawk River Sub-Basin--Continued

Name	Population served*	Project requirements	**Remarks**
Schoharie	1,063	New plant.	Plans complete. Estimated cost $125,000.
Scotia Village	8,000	Enlargement or addition to existing plant.	--
Utica	110,000	New plant.	Final plans approved 10/11/48. Estimated cost $1,941,000.
Waterville	1,618	New plant.	Plans complete. Estimated cost $235,000. Sewers and treatment works.
Whitesboro	3,500	New plant.	Final plans approved 10/6/47. Estimated cost $76,000.
Yorkville	3,400	Enlargement or addition to existing plant.	--
New York--Industrial:			
American Emblem Co., New Hartford	--	New plant.	--
Atlas Tack Co., Little Falls	--	New plant.	--
Beechnut Packing Co.,	--	New plant.	Final plans approved 2/16/48. Estimated cost $11,000.
Bigelow Sanford Carpet Co., Amsterdam	--	New plant.	--
Bisbie Linseed Oil Co., Amsterdam	--	New plant.	--
Borden Co., Newport	--	New plant.	--
Burrows Paper Co., Little Falls	--	New plant.	--
Capron Plant Sitroux, Inc., Utica	--	New plant.	--
Carmichael Hill Cheese Plant, North Western	--	New plant.	--
Clark Mills Co., Clark Mills	--	New plant.	--
Cody & Adler, Newport	--	New plant.	--
Dairymen's League Holland Patent	--	New plant.	--
Dairymen's League, Kast Bridge	--	New plant.	--
Dairymen's League, Middleville	--	New plant.	--
Dairymen's League, Remsen	--	New plant.	Final plans approved 10/11/26.
Dairymen's League, Solsville	--	New plant.	--
Martin Deischel Leather Co., Gloversville	--	New plant.	--
General Cable Corp., Rome	--	New plant.	--
Gilbert Knitting Mills, Elizabeth St., Little Falls.	--	New plant.	--
Gilbert Knitting Mills, W. Main St., Little Falls	--	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Mohawk River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Haxton Canning Co., Kirkland....................	--	New plant.	--
Haxton Canning Co., Waterville..................	--	Replacement of existing plant.	--
Hillside Cheese Plant Hillside....................	--	New plant.	--
Hinman Farm Prod. Co., Deansboro..................	--	New plant.	--
Holland Patent Farmers Co-op., Holland Patent.............	--	New plant.	--
A. D. Julliard Co., Inc. Plant No. 1, N.Y. Mills....	--	New plant.	--
A. D. Julliard Co., Inc. Plant No. 2, N.Y. Mills....	--	New plant.	--
A. D. Julliard Co., Inc. Plant No. 3, N.Y. Mills....	--	New plant.	--
Jeter Dairy Co., Floyd......................	--	New plant.	--
Kraft Foods Co., Floyd......................	--	New plant.	--
Lexington Farms, Inc. Lexington..................	--	New plant.	--
Little Falls Dairy Co., Little Falls................	--	New plant.	--
Little Falls Mfg., Little Falls................	--	New plant.	--
Middleville Leather Corp., Middleville.................	--	New plant.	--
Milligan & Higgins Corp., Johnstown..................	--	New plant.	--
Mohawk Carpet Mills, Inc. Harrower, Amsterdam........	--	New plant.	--
Mohawk Paper Co., Little Falls...............	--	New plant.	--
Mohawk Carpet Mills, Inc. Lyon Street, Amsterdam.....	--	New plant.	--
Muller Dairies, Inc., Bouchville.................	--	New plant.	--
E. S. Parkhurst & Co., Gloversville...............	--	New plant.	--
Poland Milk Prod. Co-op, Poland.....................	--	New plant.	--
Prattsville Packing Co., Prattsville...............	--	New plant.	--
Quaker Hill Cheese Plant Beartown....................	--	New plant.	--
Queensboro Farm Prod, Inc., Indian Castle..............	--	New plant.	--
Queensboro Farm Prod. Inc., Van Hornesville............	--	New plant.	--
M. H. Renken Dairy Co., Frankfort..................	--	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Mohawk River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
M. H. Renken Dairy Co., Marshall Station...........	--	New plant.	--
Revere Brass & Copper Co., Rome......................	--	Enlargement or addition to existing plant.	--
Rome Army Air Depot, Rome......................	--	Enlargement or addition to existing plant.	--
Rome Cable Corp., Rome......................	--	New plant.	--
Shenandoa Rayon Corp., Utica......................	--	New plant.	--
Sitroux Inc., Clayville..................	--	New plant.	--
Smeallie & Voorhies, Amsterdam..................	--	New plant.	--
H. P. Snyder Mfg. Co., Little Falls................	--	New plant.	--
South Trenton Cheese Plant, S. Trenton................	--	New plant.	--
Spargo Wine Co., Rome.......	--	New plant.	--
Standard Silk Co., Chadwicks..	--	New plant.	--
Utica Knitting Co., Plant No. 3, Oriskany Falls......	--	New plant.	--
Utica-Willowvale Bleaching Co., Willowvale............	--	New plant.	--
Upper Hudson River Sub-Basin			
Massachusetts--Municipal:			
Adams.......................	5,000	New plant.	--
Briggsville.................	164	New plant.	--
Cheshire....................	44	New plant.	--
Williamstown................	4,000	New plant.	--
New York:			
Ballston Spa................	4,000	Enlargement or addition to existing plant.	Preliminary plans approved. Estimated cost $125,000.
Corinth.....................	2,500	Replace existing plant.	--
Fort Edwards................	3,500	New plant.	Final plans approved 10/7/47. Estimated cost $154,000.
Glens Falls.................	20,000	Enlargement or addition to existing plant.	--
Greenwich..........	600	New plant.	Final plans approved 11/6/46. Estimated cost $202,000.
Hoosic Falls................	4,280	New plant.	--
Hudson Falls................	7,000	Enlargement or addition to existing plant.	Final plans approved 1/30/39.
Johnsburg...................	--	New plant.	Preliminary plans completed. Estimated cost $87,000. Sewers and treatment plant.
Mechanicsville..............	8,000	Enlargement or addition to existing plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Upper Hudson River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Northville	1,135	New plant.	Plans complete. Estimated cost $95,000.
Round Lake	600	Replace existing plant.	--
Salem	1,061	New plant.	Plans complete. Estimated cost $91,000. Sewers and treatment plant.
Saratoga Springs	14,000	Enlargement or addition to existing plant.	--
Speculator	278	New plant.	Plans complete. Estimated cost $99,000.
Stillwater	300	New plant.	Final plans approved 3/5/41.
Warrensburg	400	New plant.	Final plans approved 10/27/28.
Waterford	3,000	New plant.	--
Vermont:			
Bennington Village	8,100	New plant.	--
North Bennington	800	New plant.	--
North Pownal	150	Enlargement or addition to existing plant.	--
Massachusetts--Industrial:			
Electric Equipment Mfg., North Adams	--	New plant.	--
Lime Co., Adams	--	Enlargement or addition to existing plant.	--
Lime Co., Zlonite	--	Enlargement or addition to existing plant.	--
Paper Mill, Adams	--	New plant.	--
Photographic Material Mfg., Williamstown	--	New plant.	--
Pulp and Paper Mill, Zlonite	--	New plant.	--
Tannery, North Adams	--	New plant.	--
Textile Mill, Adams	--	New plant.	--
Textile Mill, Briggsville	--	New plant.	--
Textile Mill, North Adams	--	New plant.	--
Textile Mill, Renfrew	--	New plant.	--
New York:			
American Wood Board Co., Clark Mills	--	New plant.	--
Blandy Paper Co., Center Falls	--	New plant.	--
Finch Pruyn Glens Falls	--	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Upper Hudson River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Ft. Miller Pulp & Paper Co., Fort Miller	--	New plant.	--
Gotham Paper Co., Battenville	--	New plant.	--
Imperial Paper Co., Glens Falls	--	New plant.	--
International Paper Co., Corinth	--	New plant.	--
Marinette Paper Co., South Glens Falls	--	New plant.	--
Schroon River Paper Co., Warrensburg	--	New plant.	--
Scott Paper Co., Fort Edward	--	New plant.	--
Stevens & Thompson Middle Falls	--	New plant.	--
Stillwater Knitting Co., Stillwater	--	New plant.	--
Stillwater Paper Co., Stillwater	--	New plant.	--
Union Bag & Paper Co., Fenimore	--	New plant.	--
Union Bag & Paper Co., Hudson Falls	--	New plant.	--
United Paper Board Co., Thompson	--	New plant.	--
United Paper Board Co., Victory Mills	--	New plant.	--
Wallomsac Paper Co., Wallomsac	--	New plant.	--
West Virginia Pulp & Paper Co., Mechanicsville	--	New plant.	--
Vermont:			
Gravel Co., S. Shaftsbury	--	New plant.	Lagoons may suffice.
Paper Mill, Paper Mill Village	--	New plant.	--
Tannery, Pownal	--	New plant.	--
Textile Mill, Bennington	--	New plant.	--
Textile Mill, Bennington	--	New plant.	--
Textile Mill, Bennington	--	New plant.	--
Textile Mill, Bennington	--	New plant.	--
Textile Mill, Bennington	--	New plant.	--
Wood Products Co., Arlington	--	New plant.	Better housekeeping may suffice.

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Lower Hudson River Sub-Basin

Name	Population served	Project requirements	Remarks
New York--Municipal:			
Albany	130,000	Enlargement or addition to existing plant.	Final plans approved 4/14/49. Estimated cost $1,500,000.
Athens	1,800	New plant.	Final plans approved 1/7/25.
Beacon	6,250	New plant.	Final plans approved 11/14/35.
Borden Home	40	New plant.	--
Catskill	5,500	New plant.	--
Castleton	1,500	New plant.	--
Cohoes	23,000	New plant.	Final plans approved 8/12/38. Estimated cost $303,000.
Cold Spring	800	New plant.	Final plans approved 10/18/38. Estimated cost $80,000.
Coxsackie	2,200	New plant.	Final plans approved 8/25/31.
Delmar Elsmere Sanitary District	4,000	Enlargement or addition to existing plant.	--
East Greenbush	837	New plant.	Preliminary plans complete. Estimated cost $335,000. Sewers and treatment plant.
Florida	1,378	New plant.	--
Green Island	5,000	New plant.	--
Goshen	3,200	Replace existing plant.	Final plans submitted 4/11/49. Estimated cost $100,000.
Greenport Sanitary District	800	Enlargement or addition to existing plant.	--
Hercules Powder Co	550	Enlargement or addition to existing plant.	--
Hudson	12,000	New plant.	--
Latham Sewerage Dist	1,700	Enlargement or addition to existing plant.	--
Maplewood Sanitary District	2,500	Replace existing plant.	--
Menands	1,700	New plant.	Final plans approved 10/7/41. Estimated cost $175,000.
Middletown	22,000	Enlargement or addition to existing plant.	Final plans approved 12/16/46. Estimated cost $266,000.
Montgomery	1,066	New plant.	Plans complete. Estimated cost $192,000. Sewers and treatment plant.
Mountaindale	4,000	New plant.	Plan under preparation. Estimated cost $204,000. Sewers and treatment plant.
Newburgh	32,000	New plant.	Preliminary plans approved 7/8/41. Estimated cost $539,000.
New Paltz	--	New plant.	Engineers have been employed.
North Greenbush	--	New plant.	Preliminary plans underway. Estimated cost $267,000. Sewers and treatment plant.
Philmont	500	New plant.	--
Poughkeepsie	40,000	New plant.	Preliminary plans approved 4/29/46. Estimated cost $624,000.
Ravenna	1,800	Enlargement or addition to existing plant.	--
Rensselaer	12,000	New plant.	--
Rosendale	671	New plant.	--

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Lower Hudson River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
St. Anne's Hermitage	--	New plant.	--
Tivoli	760	Enlargement or addition to existing plant.	--
Troy	74,000	New plant.	Final plans approved 11/27/28.
U.S. Military Academy, West Point	10,000	New plant.	--
Valatie	1,200	New plant.	--
Wappinger Falls	3,000	Enlargement or addition to existing plant.	--
Warwick	2,670	New plant.	Plans complete. Estimated cost $260,000. Sewers and treatment plants.
New York--Industrial:			
A. P. W. Paper Co., Albany	--	New plant.	--
American Felt Co., Newburgh	--	New plant.	--
Ancram Paper Mills, Ancram	--	New plant.	--
Anjopa Paper Co., Napanock	900	New plant.	--
Bordens, Otisville	--	Enlargement of existing plant.	--
Bordens - Pine Bush Crawford (T)	200	Replacement of existing plant.	--
Bordens, Warwick	--	New plant.	--
Borden Farm Products Co., Washingtonville	--	New plant.	--
Borden Johnson, Johnson	200	New plant.	--
T. Brenner Pasteur Plant, Poughkeepsie	--	New plant.	--
Bullville Creamery, Bullville	--	New plant.	--
Callanan Road Improve, Co., Esopus	--	Enlargement of existing plant.	--
Cantine Mills, Saugerties	--	New plant.	--
Chester Rendering Co., Chester	--	New plant.	Plans submitted 12/5/46.
Columbia Boxboard Mills, Chatham	--	New plant.	--
Continental Hide and Skin Co., Peekskill	--	New plant.	--
Cornwall Press, Cornwall on Hudson	--	New plant.	--
Crowley Milk Co., New Windsor	--	New plant.	--
Dairy League, Ellenville	120	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Lower Hudson River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Dairymen's League, Goshen	70	Replacement of existing plant.	--
Dairymen's League, Accord	72	Replacement of existing plant.	--
Decomart, Warwick	20	New plant.	--
DeLaval Separator Co., Poughkeepsie	--	New plant.	--
Ellenville Laundry, Ellenville	800	New plant.	--
Fabricon Pro. Co., Saugerties	--	New plant.	--
Ferndale Farms, Ferndale	500	New plant.	--
Firth Carpet, Newburgh Cornwall	--	Enlargement or existing plant.	--
Forst Packing Co., Kingston	4,000	New plant.	--
Four Diff. Mills, Philmont	--	New plant.	--
Frisbie Bakery, Poughkeepsie	--	New plant.	--
Hercules Powder Co., Port Ewen	--	New plant.	Extensive study required to properly treat all waste.
Hollander Fur, Middletown	2,000	Replacement of existing plant.	--
Hoyt Farm	50	New plant.	--
I.B.M., Poughkeepsie	--	New plant.	Final plans approved 10/7/47.
Independent Meat Dealers, Kingston	--	Enlargement of existing plant.	--
Jensen Dairy, Unionville	200	New plant.	--
Little Falls Paper Co., New Windsor	--	New plant.	--
Montgomery Worsted	4,300	New plant.	--
Morgan Linen Co., Menands	--	New plant.	--
Muller Dairy	200	New plant.	--
N.Y.O. & W.R.R., Middletown	--	New plant.	--
National Gypsum Co., New Windsor	--	New plant.	--
Newburgh Bleach, Newburgh	--	New plant.	--
Newburgh Sandstone & Gravel, New Windsor	--	Enlargement of existing plant.	--
L. Newhoff & Sons, Albany	--	New plant.	--
Pleasant Valley Finish Co., Poughkeepsie	--	New plant.	--
Poughkeepsie Fdry., Poughkeepsie	--	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Lower Hudson River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Rondout Paper Co., Napanock	10,620	New plant.	--
Ruffelt Hat Co., Wallkill	130	New plant.	--
Schatz Mfg. Co., Poughkeepsie	--	New plant.	--
Shawangunk Co-op Dairy, Kyserike	572	Replacement of existing plant.	--
Skyer Slaughter House Newburgh	--	New plant.	--
Thermo Mills, Inc. Hudson	--	New plant.	--
Warwick Dairy, Warwick	15	New plant.	--
Watervliet Arsenal Watervliet	--	New plant.	--
Whitman Pub. Co., Poughkeepsie	--	New plant.	--
New Jersey:			
Franklin Lake Dairy Producers, Inc., Wantage Township	--	Enlargement or addition to existing plant.	--
Franklin Laundry, Inc., Franklin	--	New plant.	--
Ideal Farms, Inc., Sussex	--	New plant.	--
Newark Milk & Cream Co., Lewisburg	--	New plant.	--
New Jersey Zinc Co., Franklin	--	New plant.	--
Reese Harden Co., Hamburg	--	New plant.	--
Sheffield Farms, Inc., Hamburg	--	Enlargement or addition to existing plant.	--
Sussex Milk & Cream Co., Prices Switch	--	New plant.	--
Sussex Milk & Cream Co., Sussex	--	New plant.	--
Valco Mfg. Co., Franklin	--	New plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

NEW JERSEY-NEW YORK COAST DRAINAGE BASIN

Sub-Basins { Northern New Jersey-New York Metropolitan Area and Long Island
New Jersey Coast

General Description

The drainage basin of the New Jersey - New York Coast consists of two sub-basins, the Northern New Jersey and New York Metropolitan Area including Long Island, and the New Jersey Coast. The drainage area of the former is about 4,700 square miles and includes the Hudson River from the Northern Westchester County Line, the Hackensack, Passaic, Rahway and Raritan Rivers in New Jersey, the Long Island Sound drainage of Westchester County to the Connecticut State boundary and all of Long Island. The New Jersey Coast Sub-Basin extends from Atlantic Highlands to Cape May and the drainage is from an area of about 2,500 square miles. At their greatest combined length these sub-basins extend for some 200 miles and at their greatest width for 170 miles.

Although located in the most easterly portion of the North Atlantic Drainage Basins, the area of the New Jersey, New York Metropolitan Area is in nearly all respects the hub not only of this entire drainage region but also of the entire Nation.

In northern New Jersey and the New York counties of Rockland and Westchester, the river valleys are narrow, deep and rocky. In southern New Jersey and most of Long Island the topography is nearly flat or gently rolling with broad river valleys at low altitudes. Of the 17 principal streams other than the lower stretch of the Hudson, the largest two are the Raritan and Passaic Rivers, draining areas of 1,105 and 949 square miles, respectively.

Between the barrier island along the Atlantic Ocean and the mainland in New Jersey there is an extensive system of inland bays and tidal estuaries for 80 miles. The largest body of water in this tidal system is Barnegat Bay, about 20 miles long and three miles wide. Along the south shore of Long Island there are similar barrier islands and tidal estuaries, including Great South Bay and a system of inland waterways.

The north New Jersey and New York areas of this drainage are characterized by sharp parallel ridges and rolling uplands. In contrast the terrain of Long Island and central and south New Jersey is sandy and flat. In the latter the coastal region is characterized by the Pine Barrens and extensive swamp areas.

The average annual temperature ranges from about 49°F. in the northern sectors to 54°F. at Cape May, N. J. The average annual precipitation ranges from 40 to 50 inches, heaviest in the highland portion of the basin. This precipitation is distributed quite evenly through the year with slightly less than the average in the spring months and slightly more in the summer. Snow represents roughly eight percent of the total annual precipitation. The normal condition of humidity is very much alike for all the coastal region from Long Island Sound to the Virginia Capes. The mean relative humidity in New York City averages within a few percent of being the same for all months in the year, although there are conjunctions of excessive urban heat and oceanic moisture that occur a few times each summer, lasting for a day or two.

The change of seasons progresses gradually in this region, thus affording unusually favorable conditions in the spring for the starting of the crop season, with only rare cases on record of cold periods damaging early vegetation. The average length of the growing season varies from about 150 days in the north to 210 days in the south.

Economic Development

The preliminary figures of the 1950 census indicate that over 13,287,000 people live in the New Jersey, New York Coastal Drainage. Of these, 97 percent or 12,880,000 live in the greater New York Metropolitan area. The total population of this area represents about 8.8 percent of the total population of the United States.

In keeping with the unusually high population density of over 3,600 per square mile in the New York Metropolitan Area, this area economically represents also the highest concentration of wealth, industry, and business in the entire country. Over 20 percent of the industrial establishments of the Nation are located here, employing 10.7 percent of the production workers and producing 12.5 percent of the value added by manufacture.

A recent analysis of the 1948 Census of Business by the New York Times research department notes that retail sales in New York

City are almost twice those of the second largest city in the United States and more than three times those of the third. Retail trade in the New York Market (not quite coincident with the New York Metropolitan Drainage Area) accounted for 10.9 percent of the U.S. total, wholesale trade for 22.1 percent, service trades 18.4 percent, hotels for 15.9 percent and amusements 17.4 percent. This intense economic activity is carried on in an area of only about 0.1 percent of the entire country.

The New Jersey Coastal Drainage represents an entirely different economy. Its many farms (4,700 in 1945) help supply food to both the New York and Philadelphia Metropolitan areas with farm products valued at $29,000,000 in 1945. However, the unparalleled beaches of the entire New Jersey Coast and their proximity to the large population centers to the north and west have resulted in the development of New Jersey's largest single industry, the resort business. It is now estimated to be worth over a billion dollars a year and serves an estimated 25,000,000 vacationists and day visitors annually.

Uses of Water Resources

The problem of supplying safe and adequate water to the millions of people living in this region has been met by extensive development of both surface and ground water supplies. The first developed stage of New York City's water supply program, the Croton watershed, is in this drainage area and currently supplies 330 m.g.d. or about 30 percent of the daily demand. Practically all the communities of North Jersey have extensive watershed areas within the drainages of the Raritan, Rahway, Passaic or Hackensack Rivers, either privately or municipally owned. In the coastal drainage of New Jersey and Long Island ground water supplies have been developed as the principal sources of domestic water.

The recreational use of the marine waters of this area has already been indicated in the section on economic development. In addition, there is an estimated $15,000,000 investment with an annual return of about $750,000 from the charter and party boat fishing in the New York Metropolitan Area. The commercial fisheries of the New Jersey-New York Coastal Drainage had a value of over $21,000,000 in 1945 or about eight percent of the combined value of the U.S. and Alaska catch. There are over 47,000 powered pleasure boats over 16 feet. in length registered in this area.

The farmers of south New Jersey and Long Island have in recent years developed irrigation on the truck farms in order to assure a successful and premium quality crop. Most of the water so used comes from underground aquifers. However, over-pumpage of underground supplies in the coastal areas increases the hazard of salt water intrusion and in some locations has already resulted in loss of supply.

The coastal waters of New Jersey are used extensively for navigational purposes, carrying a tremendous coastal tonnage to and from the Port of New York. The port itself is the largest in the world in terms of ship movements and volume of goods handled.

NEW JERSEY-NEW YORK METROPOLITAN AREA AND LONG ISLAND SUB-BASIN

Pollution Contributed to Water Resources

In the New Jersey-New York Metropolitan Area there are a total of 240 sources of municipal sewage contributed from a population of over 11,800,000. However, of these sources, 128 are effluents of plants with satisfactory capacity. These satisfactory plants serve a population of 4,439,000.

A total of 111 sources of industrial pollution are noted for this area, of which 91 produce organic effluents, 11 inorganic waste and nine are undetermined. Of the 111 reported plants, 66 have some sort of treatment facility. The figure of 111 sources of industrial pollution is a very conservative one pending completion of the industrial survey of the Interstate Sanitation Commission. Their preliminary figures indicate that sources of industrial pollution in this area may number over 600.

Pollution Prevention Measures in Effect

Treatment facilities for municipal sewage of this area include 112 primary plants serving a population of over 3,000,000; 90 secondary plants serving over 3,500,000. There are 40 municipal sources of pollution with no treatment involving a population of over 5,200,000.

Of 111 classified industries, consisting principally of food processing plants and producers of chemicals and chemical products, there are 66 with some sort of treatment facility, 38 with no treatment and seven with undetermined facilities.

Adequacy of Existing Treatment Facilities

Of existing municipal treatment facilities, 128 are satisfactory in capacity, serving a population of 4,439,000, 62 are unsatisfactory, serving 2,131,000 and 12 are undetermined, serving 10,354. The operation of 168 are satisfactory, only 14 unsatisfactory and 20 undetermined. Industrial treatment facilities indicate 36 satisfactory in capacity and 11 unsatisfactory. The capacity of 19 are undetermined.

Progress in Pollution Abatement

Construction of sewage treatment facilities in this region was at a slow but steady rate on a unit basis from 1910 to 1925. From 1925 to 1940 the number of new plants that went into operation each year accumulated at an even faster rate, but not until the period of 1936 to 1940 was there a marked jump in the design population that was being provided for by new construction. This sharp increase reflected the Federal aid that was being made available through work relief programs. However, the war period brought a marked slowing of the rate of construction which by 1948 showed signs of new activity again.

The period of 1946-1949 saw the completion of 13 plants with a total design population of 589,000, of which over 87,000 was in the capacity of seven enlarged plants. However, projects now under construction in New York City alone will serve populations totaling 1,684,000 and projects slated for completion by 1959 will serve an additional 2,856,000. Major trunk sewers are under construction or being planned for the Hackensack and Raritan Rivers. Many additional communities bordering on the waters of the metropolitan area are building treatment plants or are in the stage of planning them.

Pollution Prevention Measures Required

Plant requirements for the New Jersey-New York Metropolitan area indicate the need for 37 new municipal plants serving a population of over 5,200,000. About 2,343,000 will be served by enlargements or additions to 49 existing plants. Thirty-one existing plants require replacement but they serve only about 281,000. The status of seven projects is undetermined and 116 municipal plants serving 3,940,000 require no projects. Thirty-three new industrial treatment plants are needed, 13 require enlargements, 19 are undetermined and 46 require no project, being satisfactory as they are now.

Of the treatment works projects for abating pollution, no formal action has been taken on 24 municipal sources of pollution, 12 have been ordered to abate pollution, 17 have plans under preparation, 23 have had final plans approved, six are awaiting financing and 14 projects are under construction. One trunk sewer and treatment plant under construction will satisfy the project requirements of 16 municipalities and five industries. The status of one treatment project is undetermined. Eleven industrial plants have been ordered to abate pollution, 12 have their plans under preparation, two have had the final plans approved, five are under construction and no formal action has been taken for 38.

Table A. Sources of pollution*, municipal, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin

Municipalities**	Sources of pollution (in number of municipalities)	Population served by sewerage system	Amount of pollution discharged to watercourse (in terms of equivalent number of people)***
Having data on pollution load discharged to watercourse	59	423,083	453,260
Having population data available (Data on pollution load to watercourse incomplete or not available)	181[1]	11,451,516	Not applicable
Total	240[2]	11,874,599	--

*The data appearing in this and the subsequent tables for this sub-basin are summations of readily available information. In some cases the data are incomplete. Further, arrangement of data in these tables is difficult because many municipalities have multiple outlets, many of the existing treatment facilities serve several municipalities, and in some cases several treatment plants serve a single municipality. Accordingly, in comparing the tables minor irregularities may become apparent.

In subsequent reports, these inconsistencies will disappear as field investigations are made and the more complete information is obtained.

**Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

***Includes industrial wastes discharged into municipal sewerage systems.

[1] The principal outfalls and sewage treatment plants of New York City are considered as separate sources of pollution rather than as one municipality.

[2] No population data from 14 small sources.

Table B. Sources of pollution, industrial*, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin

Industries	Sources of pollution (in number of plants)	Amount of pollution discharged to watercourse (in terms of equivalent number of people)
Producing organic wastes	35	919.394
Producing organic wastes	56	Undetermined
Producing inorganic wastes	11	Not applicable
Producing wastes of undetermined type	9	undetermined
Total	111	--

*Industries having separate outlets and discharging wastes directly to watercourse.

Table C. Existing treatment facilities, municipal, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin

Degree of treatment provided	Number		Population served
	Municipalities*	Plants	
Primary	102[a]	112[b]	3,028,221
Secondary	86	90[c]	3,552.612
No treatment	30[d]	--	5,293,766
Total	218	202	11,874,599

*Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts. counties. towns; significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

[a] Including 13 municipalities with screen effluents; population served 598,100. New York City has 5 screening and 3 primary treatment plants.

[b] No population data for 9 plants. Two small municipalities each have two plants on the same stream.

[c] No population data for 4 plants. New York City has 5 secondary treatment plants.

[d] Thirty (30) municipalities with no treatment recorded as 40 sources of pollution in Table "A" include 10 major municipal outfalls in New York City receiving no treatment and 2 in Jersey City.

Table D. Existing treatment facilities, industrial*, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin

Type of industry	Number of plants	Number of industrial plants having:		
		Treatment facilities	No treatment facilities	Undetermined facilities
Food and kindred products................	25	13	9	3
Textile mill products.....	8	4	4	0
Paper and allied products................	9	8	1	0
Chemical and allied products................	30	18	10	2
Petroleum and coal products................	4	1	3	0
Rubber products...........	1	1	0	0
Primary metal products....	2	2	0	0
Fabricated metals.........	9	4	5	0
Miscellaneous.............	23	15	6	2
Total....................	111	66	38	7

*Industries having separate outlets and discharging wastes directly to watercourses.

Table E. Adequacy of existing treatment facilities, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin

Existing treatment facilities	Number	Adequacy with relation to:					
		Capacity			Operation		
		Satis-factory	Unsatis-factory	Unde-termined	Satis-factory	Unsatis-factory	Unde-termined
Municipal	202[a]	128[b]	62[c]	12[d]	168[e]	14[f]	20[g]
Industrial	66	36	11	19	44	5	17

[a] Serve a population of 6,580,833.

[b] Serve a population of 4,439,576.

[c] Serve a population of 2,130,903.

[d] Serve a population of 10,354.

[e] Serve a population of 5,957,058.

[f] Serve a population of 136,445.

[g] Serve a population of 487,330.

Table F. Progress in pollution abatement, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin

Year	Municipal		Industrial	
	Plants completed	Design population	Plants completed	Amount of waste treated (in terms of equivalent number of people)
1946	1	500	--	--
1947	None	--	--	--
1948	3 (enlarged)	8,785 (enlarged)	--	--
1949	9 (4 enlarged)	579,740 (79,000 enlarged)	--	--

Table G. Requirements for municipal and industrial waste treatment plants*, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin

Requirements	Municipal		Industrial
	Number	Population served by facilities	Number
New plant	37[a]	5,290,366	33
Enlargement or additions to existing plant	49[b]	2,343,003	13
Replace existing plant	31	280,970	0
No project required	116	3,947,900	46
Undetermined	7	12,360	19
Total	240	11,874,599	111

*The needs set forth in this table are based on presently available information. However, future studies and evaluation may result in some changes in these needs.

[a] Municipalities requiring eleven new plants to serve 117,570 will be taken care of by the Bergen County Trunk Sewer and treatment plant.

[b] Municipal requirements for five enlargements or additions to plants, serving 40,370 will be taken care of by the Bergen County Trunk Sewer and treatment plant.

Note: Plant requirements for some New York City projects will be satisfied by flow diversion to one new plant which will handle the sewerage of two or more old plants or outfalls.

Table H. Status of treatment works project to abate pollution, July 1, 1950, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin

Status of project	Number	
	Municipal	Industrial
No formal action	24	38
Abatement ordered	12	11
Plans under preparation	17[a]	12[a]
Final plans approved	23	2
Construction awaiting financing	6	0
Under construction	14[b]	5[b]
Status undetermined	1	0

[a] One municipal and eight industrial projects will be served by trunk sewer and treatment plant now in planning stages.

[b] One trunk sewer and treatment plant now under construction will serve 16 municipalities and five industries on project list.

Table I. List of Needed Projects, Northern New Jersey-New York Metropolitan Area and Long Island Sub-Basin

Municipalities and industries needing new or improved treatment facilities are tabulated on the following pages. "Municipalities" in the tabulations includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

The list is based upon information readily available pending completion of additional field surveys and investigations by the respective State water pollution control boards. It is admittedly incomplete but is believed to contain most of the significant sources of pollution. Consequently, the requirement "new plant" may upon future investigation indicate connection to city sewers, or other alternate requirements for industries and in some instances for small municipalities or areas contiguous to larger areas having treatment facilities.

Municipalities and industries desiring detailed information on problems affecting them are referred to their State water pollution control agency.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin

Name	Population served	Project requirements	Remarks
New Jersey--Municipal:			
Bayonne	79,000	New plant.	Final plans approved
Bergenfield Dumont	20,000	Enlargement or addition to existing plant.	To connect to Bergen County Trunk Sewer in 1953.
Bogota	8,300	Replace plant.	To connect to Bergen County Trunk Sewer in 1953.
Caldwell	9,800	Enlargement or addition to existing plant.	No action.
Carteret	12,000	New plant.	Construction awaiting financing.
Cliffside Park	17,000	Enlargement or addition to existing plant.	Abatement ordered.
Edgewater	4,000	New plant.	Abatement ordered.
Englewood	21,000	Replace plant.	To connect to Bergen County Trunk Sewer in 1951.
Fairview	10,000	Replace plant.	To connect to Bergen County Trunk Sewer in 1951.
Fort Lee	10,000	New plant.	To connect to Bergen County Trunk Sewer in 1951.
Guttenberg	6,200	New plant.	Construction awaiting financing.
Hoboken	50,000	New plant.	Plans under preparation.
Jersey City New York Bay	177,000	New plant.	Plans under preparation.
Jersey City Newark Bay	118,000	New plant.	Abatement ordered.
Kearney	--	Replace plant.	Construction awaiting financing.
Leonia	6,550	Replace plant.	To connect to Bergen County Trunk Sewer in 1951.
Linden-Roselle Sewerage District	38,000	New plant.	Under construction.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin—Continued

Name	Population served	Project requirements	Remarks
Little Falls Township	5,400	Enlargement or addition to existing plant.	Under construction.
Little Ferry	5,170	Enlargement or addition to existing plant.	To connect to Bergen County Trunk Sewer in 1953.
Lyndhurst	20,240	Replace plant.	No action.
Madison Chatham	12,830	Enlargement or addition to existing plant.	Construction awaiting financing.
Manville	6,100	Enlargement or addition to existing plant.	Final plans approved.
Metuchen	6,600	Enlargement or addition to existing plant.	Final plans approved.
Middlesex Borough	3,700	Enlargement or addition to existing plant.	Pilot plant studies being made, re: industrial wastes.
Middlesex Borough Joint Meeting Plant	60,000	Enlargement or addition to existing plant.	Final plans approved.
New Brunswick	35,000	Replace plant.	Final plans approved.
New Jersey State Hospital Graystone Park	7,000	Enlargement or addition to existing plant.	No action.
New Milford	3,600	Enlargement or addition to existing plant.	To connect to Bergen County Trunk Sewer in 1953.
New Providence	2,200	Enlargement or addition to existing plant.	Final plans approved.
North Arlington	11,200	Replace plant.	No action.
North Bergen Hudson River	10,000	New plant.	Abatement ordered.
North Bergen Bellmans Brooks	45,000	Enlargement or addition to existing plant.	Abatement ordered.
North Brunswick Township	4,500	Replace plant.	Abatement ordered
Oradell	3,200	Enlargement or addition to existing plant.	To connect to Bergen County Trunk Sewer in 1953.
Passaic Valley Sewerage District	1,100,000	Enlargement and addition to existing plant.	Plans in preparation.
Palisades Park	9,200	Replace plant.	To connect to Bergen County Trunk Sewer in 1951.
Paterson	--	New plant.	Eleven sewer outfalls discharging to river. Passaic Valley Sewerage Commission claims dilution by washwaters sufficient so that Passaic River not seriously affected.
Radburn	8,000	Enlargement of existing plant.	Under construction.
Raritan	5,000	Replace plant.	Abatement ordered.
Raritan Township Silver Lake Section	6,500	Enlargement or addition to existing plant.	No action.
Ridgefield	6,000	Replace plant.	To connect to Bergen County Trunk Sewer in 1951.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin--Continued

Name	Population served	Project requirements	Remarks
Ridgefield Park	12,800	Replace plant.	To connect to Bergen County Trunk Sewer in 1951.
Ridgewood	15,000	Enlargement of existing plant.	Plans in preparation - pilot plant being operated.
River Edge	3,700	Replace plant.	To connect to Bergen County Trunk Sewer in 1953.
Rochelle Park	2,600	Replace plant.	Seeking admission to Passaic Valley Sewerage Commission Trunk Sewers.
Rockaway Valley	27,500	Enlargement or addition to existing plant.	Under construction.
Secaucus	11,000	Replace plant.	Construction awaiting financing.
South Bound Brook	2,000	Enlargement or addition to existing plant.	Construction delayed pending development of Middlesex County Trunk Sewer Project.
South Hackensack	1,320	Replace plant.	To connect to Bergen County Trunk Sewer in 1953.
South River	11,000	Enlargement or addition to existing plant.	Abatement ordered.
Somerville	10,000	Replace plant.	Abatement ordered.
Teaneck	28,700	Replace plant.	To connect to Bergen County Trunk Sewer in 1951.
Tenafly	8,400	Enlargement or addition to existing plant.	To connect to Bergen County Trunk Sewer in 1951.
Union City	56,000	New plant.	Final plans approved.
Weehawken	15,000	New plant.	Final plans approved.
West New York	40,000	New plant.	Final plans approved.
Woodbridge	16,000	New plant.	Construction awaiting financing.
New York--Municipal:			
Association for the Poor, Staten Island	400	Enlargement or addition to existing plant.	No action.
Brewster	600	Enlargement or addition to existing plant.	No action.
Briarcliff Manor	900	Enlargement or addition to existing plant.	No action.
Carmel	3,000	New plant.	Final plans approved.
Carmel Sanitary District No.1.	1,500	Enlargement or addition to existing plant.	Final plans approved.
Croton-on-Hudson	3,800	New plant.	Under construction.
Detention Station, Ellis Island	1,800	New plant.	No action.
Fort Hamilton, Brooklyn	2,000	New plant.	No action.
Fort Tilden Jamaica Bay	300	Addition or other treatment to existing plant.	Final plans approved.
Fort Totten, Queens	1,000	Addition or other treatment to existing plant.	Final plans approved.
Glen Cove	12,000	Enlargement or addition to existing plant.	Final plans approved.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin--Continued

Name	Population served	Project requirements	Remarks
Governors Island	4,500	New plant.	No action.
Great Neck Sanitary District No.1	4,500	Enlargement or addition to existing plant.	No action.
Greenwood Lake	2,207	New plant.	Final plans complete.
Harriman	—	New plant.	No action.
Hoffman Island, Lower Bay	20	New plant.	No action.
Irvington	3,300	Replace plant.	Under construction.
Jones Beach	10,000	Replace plant.	Under construction.
Lake Secor	1,800	New plant.	No action.
Larchmont	5,800	Replace existing plant.	Final plans approved.
Long Beach, New York Ave. plant	2,000	Replace existing plant.	Under construction.
Monroe	400	New plant.	Final plans approved.
Mount Loretto Home No.1, Staten Island	800	Enlargement or addition to existing plant.	No action.
Nassau County Sanitary District No.2	75,000	New plant.	Under construction.
New Rochelle	57,000	Enlargement or addition to existing plant.	Final plans approved.
New York City			
Bloomfield Area, Staten Island	3,500	New plant.	Abatement ordered.
Bowery Bay Extension	300,000	New plant.	Plans in preparation.
Canal Street Plant	38,000	Enlargement or addition to existing plant.	Flow to Newtown Creek Plant when completed.
Cromwell Ave., Staten Island	16,000	Enlargement or addition to existing plant.	Flow to Oakwood Beach plant when completed.
Dyckman Street Plant	39,000	Enlargement or addition to existing plant.	Flow to Wards Island Extension when completed.
Fresh Kills Area, Staten Island	11,500	New plant.	No action.
Hammels Treatment Plant	23,000	Enlargement or addition to existing plant.	Flow will be diverted to Rockaway plant when latter is completed.
Hunts Point	675,000	New plant.	Under construction.
Newtown Creek Area	1,359,000	New plant.	Plans in preparation.
Neponsit Plant	900	Replace plant.	Flow to Rockaway plant when completed.
Oakwood Beach, Staten Island	7,000	Enlargement or addition to existing plant.	Plans in preparation.
Owls Head	965,000	New plant.	Under construction.
Port Richmond Area, Staten Island	130,000	New plant.	Plans in preparation.
Red Hook Area	270,000	New plant.	Abatement ordered.
Rockaway Area	44,000	New plant.	Under construction.
Tallmans Island Plant	210,000	Addition to existing plant to meet interstate Compact requirements.	No action.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Wards Island Extension........	773,000	New plant.	Plans in preparation.
26th Ward.....................	400,000	Enlargement or addition to existing plant.	Under construction.
Oyster Bay District...........	3,000	Enlargement or addition to existing plant.	No action.
Patchogue.....................	3,400	Replace plant.	Final plans approved.
Peekskill.....................	17,000	New plant.	Plans in preparation.
Piermont......................	1,800	Replace plant.	No action.
Portchester...................	23,000	Replace existing plant.	Final plans approved.
Port Jefferson District.......	1,300	Replace existing plant.	No action.
Port Washington District......	11,000	Replace existing plant.	No action.
St. Josephs Home, Staten Island..............	300	Enlargement or addition to existing plant.	No action.
Sea Gate, Brooklyn............	--	Replace plant.	Flow to be diverted to Coney Island Plant.
Shanks Village................	5,000	Replace existing plant.	No action.
Spring Valley.................	4,500	Enlargement or addition to existing plant.	Preliminary plans approved.
Swinburne Island, Lower Bay...................	50	New plant.	No action.
Suffern.......................	3,800	Enlargement or addition to existing plant.	No action.
Tappen........................	1,300	New plant.	No action.
Tottenville, Statten Island..............	21,000	New plant.	No action.
U.S. Naval Experiment Station Sands Point................	400	Enlargement or addition to existing plant.	No action.
Westchester County--			
Blind Brook Project.........	9,500	Enlargement or addition to existing plant.	No action.
Mamaroneck Project..........	39,000	Enlargement or addition to existing plant.	No action.
North Yonkers Project.......	86,000	Enlargement or addition to existing plant.	No action.
South Yonkers...............	279,600	Enlargement or addition to existing plant.	No action.
New Jersey--Industrial:			
Anheuser-Busch, Old Bridge.................	63,936	New plant.	Final plans approved**
Bakelite Corp., Piscatawny Township.........	43,980	Enlargement or addition to existing plant.	Abatement ordered**
Beattie Mfg. Co., Little Falls Township.......	3,960	New plant.	Abatement ordered.
Bellman's Brook Bleachery, Fairview.........	--	New plant.	To Bergen County Trunk Sewer in 1951.
Benzal Products, Raritan Township............	680	--	**
Calco Chemical Co., Bridgewater Township.	214,056	New plant.	Pilot plant studies being made.**

See references at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin—Continued

Name	Population served *	Project requirements	Remarks
Philip Carey Mfg. Co., Perth Amboy................	13,248	Enlargement or addition to existing plant.	Abatement ordered. Pilot plant studies being made.
Consumers Farm Milk Co-op, Belle Mead..................	700	Enlargement or addition to existing plant.	Under construction.
Continental Paper Co., Ridgefield Park............	--	New plant.	To Bergen County Trunk Sewer in 1951.
Dupont Photo Products, Parlin......................	16,836	New plant.	Abatement ordered**
Federal Paper Board Co., Bogota......................	--	New plant.	To Bergen County Trunk Sewer in 1953.
Gair, Bogota Box Co., Bogota......................	--	New plant.	To Bergen County Trunk Sewer in 1953.
Heyden Chemical Corp., Fords.......................	28,266	Enlargement or addition to existing plant.	Abatement ordered**
Heyden Chemical Corp., West Windsor Township.......	250	New plant.	Pilot plant studies being made.
Jarka Corporation, Hoboken.....................	--	New plant.	Abatement ordered.
Lowe Paper Co., Ridgefield.................	--	New plant.	To Bergen County Trunk Sewer in 1951.
Newark Milk & Cream Co., Parsippany Township.........	--	--	Abatement ordered.
S. B. Penick & Co., Montville Township..........	--	--	Abatement ordered.
Pequanoc Rubber, Butler......................	300	Enlargement or addition to existing plant.	Plans under preparation.
Reduction & Refining Co., Kenilworth................	--	Enlargement or addition to existing plant.	Under consideration.
P. J. Schweitzer East Spotswood.............	74,900	Enlargement or addition to existing plant.	Abatement ordered.**
Thompson & Sons Dairy Livingston Township.........	--	New plant.	Abatement ordered.**
Whippany Paper Board Co., Whippany..................	5,000	Enlargement or addition to existing plant.	Under construction.
New York--Industrial:			
Allcock Mfg. Co., Ossining....................	--	New plant.	No action.
Amityville Laundry, West Amityville............	--	New plant.	No action.
Anaconda Wire & Cable Co., Hastings on Hudson..........	--	New plant.	No action.
Arden Farms Dairy, Arden.......................	--	New plant.	No action.

See references at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Blue Point Laundry, Blue Point	--	Enlargement or addition to existing plant.	No action.
Columbia Carbon and Ribbon, Glen Cove	--	New plant.	No action.
Chevrolet Motor Co., N. Tarrytown	--	New plant.	No action.
Evans Amityville Dairy, Amityville	--	Enlargement or addition to existing plant.	No action.
Fiber Conduit Co., Orangeburg	--	Addition or other treatment to existing plant.	No action.
Fisher Body Co., N. Tarrytown	--	New plant.	No action.
Gair Paper Co., Piermont	--	New plant.	Final plans approved.
Gallowhur Chemical Corp., Ossining	--	New plant.	No action.
Garnerville Holding Co., West Haverstraw	--	New plant.	No action.
Homelike Laundry, E. Rockaway	--	New plant.	No action.
Hudson Wire Co., Ossining	--	New plant.	No action.
Islip Sanitary Laundry, Bay Shore	--	Enlargement or addition to existing plant.	No action.
Kay Fries Chemicals, Inc., West Haverstraw	--	New plant.	No action.
Lederle Laboratories, Orangetown	--	?	Plans in preparation.
Lord & Burnham, Irvington	--	New plant.	No action.
Miller Dairies, W. Nyack	--	New plant.	No action.
Patchogue Plymouth Mills, Patchogue	--	Enlargement or addition to existing plant.	No action.
Pearl Waste Co., Buchanon	--	New plant.	No action.
Phelps Dodge Copper, Yonkers	--	New plant.	No action.
Pyrideum Co., Harriman	--	New plant.	Plans in preparation.
Rand McNally Co., Ossining	--	New plant.	No action.
Refined Syrup and Sugars, Yonkers	--	New plant.	No action.
Russell, Birdsall and Ward, Port Chester	--	Enlargement or addition to existing plant.	No action.
Schwartz Yarn Co., Sloatsburg	--	Enlargement or addition to existing plant.	Abatement ordered.

See references at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Northern New Jersey - New York Metropolitan Area and Long Island Sub-Basin--Continued

Name	Population served *	Project requirements	Remarks
Sloatsburg Piece Dye Works Sloatsburg..................	--	Enlargement or addition to existing plant.	No action.
Standard Brands Inc., Peekskill....................	400,000	New plant.	Abatement ordered.
Standard Coated Products, Buchanan....................	--	New plant.	No action.
Stauffer Chemical Co., Greenburgh..................	--	--	Plans in preparation.
Wah Chang Trading Corp., Glen Cove...................	--	Enlargement or addition to existing plant.	Under construction.
Yonkers Electric Light & Power, Yonkers.............	--	New plant	No action.
Zinsser & Co., Hastings on Hudson..........	--	Enlargement or addition to existing plant.	No action.

*Strength of industrial waste measured in terms of equivalent number of people.
**Construction delayed pending development of Middlesex County Trunk Sewer Project.

NEW JERSEY COAST SUB-BASIN

Pollution Contributed to Water Resources

In this region there are 53 sources of municipal sewage pollution from a total population of over 250,000. Of these sources 46 are from treatment plants which are satisfactory in capacity and serve over 210,000 people. There are only five sources of industrial pollution, four producing organic wastes and one an inorganic effluent.

Pollution Prevention Measures in Effect

Forty-four plants provide primary treatment for a population of more than 215,000 and 13 plants secondary treatment for a population of over 34,000.

Adequacy of Existing Treatment Facilities

Two of the five industrial plants have treatment facilities of which one is satisfactory. Forty-six municipal plants are satisfactory in capacity, and eight unsatisfactory, serving populations of 210,500 and 39,600, respectively. The operation of 48 municipal facilities is satisfactory and three unsatisfactory. The adequacy of three plants are undetermined with respect to capacity and six for operation.

Progress in Pollution Abatement

The progress in pollution abatement was negligible for the years 1946 to 1949, but in consideration of the progress prior to that time there is relatively little work to be done in this area in pollution abatement.

Pollution Prevention Measures Required

Only ten municipal projects are needed, one a replacement plant serving 20,000 and nine enlargements or additions serving 16,000. A population of 214,000 served by 43 plants need no projects. The requirements of four industries are undetermined and one needs no project.

The status of municipal treatment works projects for abatement of pollution is as follows: seven abatement orders have been issued, one project has plans under preparation, two are awaiting financing to start construction and no formal action has been taken in the case of three.

Table A. Sources of pollution*, municipal
New Jersey Coast Sub-Basin

Municipal-ities**	Sources of pollution (in number of munici-palities)	Population served by sewerage system	Amount of pollution discharged to water-course (in terms of equivalent number of people)***
Having data on pollution load dis-charged to watercourse	24	100,000	84,700
Having population data available (Data on pollution load to watercourse incomplete or not available)	29	150,160	Not applicable
Total	53	250,160	--

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*The data appearing in this and the subsequent tables for this sub-basin are summations of readily available information. In some cases the data are incomplete. Further, arrangement of data in these tables is difficult because many municipalities have multiple outlets, many of the existing treatment facilities serve several municipalities, and in some cases several treatment plants serve a single municipality. Accordingly, in comparing the tables minor irregularities may become apparent.

In subsequent reports, these inconsistencies will disappear as field investigations are made and the more complete information is obtained.

**Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

***Includes industrial wastes discharged into municipal sewerage systems.

Table B. Source of pollution, industrial*, New Jersey Coast Sub-Basin

Industries	Sources of pollution (in number of plants)	Amount of pollution discharged to watercourse (in terms of equivalent number of people)
Producing organic wastes	1	300
Producing organic wastes	3	Undetermined
Producing inorganic wastes	1	Not applicable
Producing wastes of undetermined type	--	Undetermined
Total	5	--

*Industries having separate outlets and discharging wastes directly to watercourse.

Table C. Existing treatment facilities, municipal, New Jersey Coast Sub-Basin

Degree of treatment provided	Number		Population served
	Municipalities*	Plants	
Primary	41	44**	215,570
Secondary	12	13	34,590
No treatment	--	--	--
Total	53	57	250,160

*Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary wastes directly to watercourse.

**Including 2 screening plants.

Table D. Existing treatment facilities, industrial*, New Jersey Coast Sub-Basin

Type industry	Number of plants	Number of industrial plants having:		
		Treatment facilities	No treatment facilities	Undetermined facilities
Food and kindred products..................	2	--	--	2
Textile products...........	1	1	0	0
Miscellaneous.............	2	1	--	1
Total....................	5	2	--	3

*Industries having separate outlets and discharging wastes directly to watercourse.

Table E. Adequacy of existing treatment facilities, New Jersey Coast Sub-Basin

Existing treatment facilities	Number	Adequacy with relation to:					
		Capacity			Operation		
		Satisfactory	Unsatisfactory	Undetermined	Satisfactory	Unsatisfactory	Undetermined
Municipal	57[a]	46[b]	8[c]	3	48[d]	3[e]	6[f]
Industrial	2	1	--	1	1	--	1

[a] Serve a population of 250,160.

[b] Serve a population of 210,500.

[c] Serve a population of 39,660.

[d] Serve a population of 218,900.

[e] Serve a population of 27,260.

[f] Serve a population of 4,000.

Table F. Progress in pollution abatement, New Jersey Coast Sub-Basin

Year	Municipal		Industrial	
	Plants completed	Design population	Plants completed	Amount of waste treated (in terms of equivalent number of people)
1946	--	--	--	--
1947	--	--	--	--
1948	1	9,600	--	--
1949	3	21,950	--	--

Table G. Requirements for municipal and industrial waste treatment plants*, New Jersey Coast Sub-Basin

Requirements	Municipal		Industrial
	Number	Population served by facilities	Number
New plant	--	--	--
Enlargement or additions to existing plant	9	16,035	--
Replace existing plant	1	20,000	--
No project required	43	214,125	1
Undetermined	--	--	4
Total	53	250,160	5

*The needs set forth in this table are based on presently available information. However, future studies and evaluations may result in some changes in these needs.

Table H. Status of treatment works project to abate pollution, July 1, 1950, New Jersey Coast Sub-Basin

Status of project	Number	
	Municipal	Industrial
No formal action	3	--
Abatement ordered	7	--
Plans under preparation	1	--
Final plans approved	--	--
Construction awaiting financing	2	--
Under construction	--	--
Status undetermined	--	4

Table I. List of Needed Projects, New Jersey Coast Sub-Basin

Municipalities and industries needing new or improved treatment facilities are tabulated on the following pages. "Municipalities" in the tabulations includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

The list is based upon information readily available pending completion of additional field surveys and investigations by the respective State water pollution control boards. It is admittedly incomplete but is believed to contain most of the significant sources of pollution. Consequently, the requirement "new plant" may upon future investigation indicate connection to city sewers, or other alternate requirements for industries and in some instances for small municipalities or areas contiguous to larger areas having treatment facilities.

Municipalities and industries desiring detailed information on problems affecting them are referred to their State water pollution control agency.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, New Jersey Coast Sub-Basin

Name	Population served	Project requirements	Remarks
New Jersey--Municipal:			
Atlantic City (Chelsea Heights Plants)....	20,000	Replace old facilities.	Has screens, needs primary treatment. No formal action taken.
Avalon........................	338	Enlargement or addition to existing plant.	Has primary treatment. Abatement of pollution ordered. Has complied with minor part of entire project.
Bay Head......................	500	Enlargement or addition to existing plant.	Has secondary treatment Abatement ordered. Plans under preparation.
Beach Haven...................	800	Enlargement or addition to existing plant.	Has primary treatment. Need pumping station to prevent surcharge of outfall during summer storms. No formal action taken.
Brigantine City...............	455	Enlargement or addition to existing plant.	Has screens. Needs primary treatment. No formal action taken.
Dover Township (Toms River)................	5,525	Enlargement or addition to existing plant.	Has primary treatment. Needs secondary treatment. Abatement ordered. Construction awaiting financing. Expect to form a sewer authority.
North Wildwood................	2,050	Enlargement or addition to existing plant.	Has primary treatment. Abatement ordered. Final plans approved.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, New Jersey Coast Sub-Basin--Continued

Name	Population served	Project requirements	Remarks
West Wildwood................	160	Enlargement or addition to existing plant.	Has primary treatment. Abatement ordered. Final plans approved. Construction awaiting financing. First phase of order completed. Has three years from 2/4/49 for completion of project.
Wildwood......................	5,500	Enlargement or addition to existing plant.	Has primary treatment. Abatement ordered. Has complied with minor part of entire project.
Wildwood Crest................	--	Enlargement or addition to existing plant.	Has primary treatment. Abatement ordered. Has complied with minor part of entire project.

Note: There are four industrial establishments for which the project requirements are undetermined.

DELAWARE RIVER BASIN

Sub-Basins
- Zone 1 - Above Trenton
- Lehigh River
- Zone 2 - Trenton to Pennypack Creek
- Zone 3 - Pennypack Creek to Delaware State Line
- Schuylkill River
- Zone 4 - Below Delaware State Line

General Description

The East and West Branches of the Delaware River rise in western slopes of the Catskill Mountains in the State of New York, at an elevation of about 1,900 feet, and flow south-westerly about 70 miles to their confluence at Hancock, N. Y.

From Hancock, the Delaware flows southward 326 miles to the sea as a boundary water, first dividing New York and Pennsylvania, then New Jersey and Pennsylvania, and finally New Jersey and Delaware. The drainage basin is approximately 250 miles in length and has a maximum width of about 90 miles. It includes an area of approximately 12,750 square miles. Approximately 18 percent of the drainage area lies in New York, 50 percent in Pennsylvania, 23 percent in New Jersey, and eight percent in Delaware. The two largest tributaries are the Lehigh and Schuylkill Rivers in Pennsylvania. The Lehigh River rises in the southwestern part of Wayne County, and flows generally southeasterly to the Delaware at Easton, Pa.; it drains an area approximately 56 miles in length with a maximum width of 36 miles, and includes about 1,370 square miles. The Schuylkill River rises in the mountains near Tuscarora, Schuylkill County, and flows southeasterly to the Delaware River at League Island Navy Yard below Philadelphia; it drains an area approximately 86 miles in length with a maximum width of about 42 miles and includes about 1,915 square miles.

The upper part of the basin lies within the glaciated area and is mountainous with numerous lakes and ponds. The formations are principally shale and sandstone with anthracite deposits in the Upper Lehigh and Schuylkill River areas. The River cuts through the Kittatinny Range at Delaware Water Gap and continues across the Appalachian Plain through rolling country to South Mountain below Easton; thence across the Atlantic Highlands where the River is bordered by alternating hills and valleys to Trenton, below which it drains the rolling agricultural land of the Coastal Plain. Trap rock, sandstone and gneiss formations predominate in the lower sections of the basin.

Average winter temperatures vary from about 23°F. in the northern portion of the basin to about 36°F. in the south, with corresponding average summer temperatures of about 66°F. and 76°F. The average annual precipitation varies from 40 to 42 inches in the lower watershed to 50 inches in the ridge areas at the headwaters. Snowfall, varies from about 50 inches in the north to 30 inches and less in the south, with very little snowfall in the southern portion after April 1.

Economic Development

The total population of the basin is estimated at close to 5,000,000. Within the area of the four States, which comprise the Delaware River Basin, there are approximately 840 separately incorporated political subdivisions. Approximately three-fourths of the inhabitants of the basin reside in urban communities having populations greater than 2,500. The Upper Delaware Basin above Trenton, covering about 53 percent of the Delaware Drainage Area, is three-fifths forested and contains approximately 25 percent of the population. Below Trenton is massed over three-fourths of the population of the basin in a densely urbanized and highly industrialized area, with more than 50 percent of the basin population in the Philadelphia-Camden area.

Widely diversified manufacturing and industrial development exists in the Lower Delaware section, in the Allentown-Bethlehem-Easton Metropolitan Area at the lower end of the Lehigh River Sub-Basin, and in the Schuylkill Valley. The major industries include the production of steel, chemicals, metal products, textiles, shipbuilding, oil refineries, printing, and paper products, stone and clay products, cement, and food products.

The upper section of the Lehigh and Schuylkill River Sub-Basins lie in the lower portion of the anthracite region, although the major coal producing area is over the divide in the

Susquehanna River Basin. The production of Portland Cement is centered in the area north of Allentown-Bethlehem.

About 8,200 square miles of open land, principally used for agriculture, is located in the Schuylkill Sub-Basin, the Lehigh Sub-Basin and the central section of the Delaware Drainage area. These areas are rich in agricultural lands, with considerable diversified farming and dairy farming. Dairy products, fruit crops, grain, livestock and poultry are produced. A section of Chester County, Pennsylvania, known as the mushroom center of the world, produces 65 percent of the entire United States marketings of mushrooms. Nearly 25 percent of the Nation's output of packed poultry is produced in the Delmarva Peninsula.

Recreation is the major industry in the Upper Delaware River Basin, where approximately 4,200 square miles is in forest or wild land, most of it located above Delaware Water Gap. Public recreational facilities are provided in numerous State parks and forests, and the recreation industry flourishes in the upper sections of the basin which abounds in recreational resources within less than two hours driving distance of more than 15 million people.

The farming areas throughout the central section of the basin are subject to moderate sheet erosion, which is particularly noticeable in the Lehigh and Schuylkill Valleys.

The Delaware River, which is tidal and navigable 130 miles inland to Trenton, has a highly developed navigation system, with Philadelphia the second most important port on the Atlantic Coast in total volume of waterborne commerce and substantial shipping at the ports of Camden, Trenton, Gloucester, Chester, and Wilmington.

Uses of Water Resources

More than 2,600,000 people are supplied with water taken from the Delaware and its tributaries. The daily consumption is approximately 600 million gallons of which about 38 percent is obtained from the Delaware, 36 percent from the Schuylkill, 21 percent from impoundments and surface streams, and the remainder from ground water. Most of the larger municipalities, except Camden, obtain their supplies from surface streams. In the Philadelphia-Camden area approximately 125 million gallons per day are pumped from wells for domestic and industrial use.

The Lower Delaware section down to Wilmington, one of the most important industrial areas in the United States, relies almost entirely on the Delaware River for industrial water supply. It has been estimated that as much as 250 m.g.d. are pumped from the Delaware, in this section, for domestic and industrial uses. It is also expected that industrial water requirements will be about 30 m.g.d. with expansion of the industrial production in the area between Philadelphia and Easton.

By 1980, two billion gallons daily may be required from the Delaware and its tributaries to meet the municipal demands of Greater New York, the Philadelphia-Camden Metropolitan Area, and adjacent areas. This water demand will be met principally from headwater reservoir developments.

Diversion of Delaware waters has been before the U.S. Supreme Court in the celebrated Delaware River Diversion Case of 1931. At that time the Court decided that New York City could divert water up to 440 m.g.d. and established conditions under which the diversion could be made, including a rule for the release of compensating water for the augmentation of dry weather flows. A multiple reservoir system has been proposed that will provide adequate storage for both domestic water supply and low flow control. It has been estimated that releases from the storage reservoirs will maintain a low flow of 4,000 c.f.s. at Trenton, whereas the present minimum low flow is approximately 1,220 c.f.s. The development of the proposed program should also benefit the valuable oyster industry in the lower Delaware River, improve recreational opportunities, and provide flood control benefits. Salt water approach upstream would be beneficially retarded in dry periods.

Pollution Contributed to Water Resources

There are 315 municipal sewer systems, serving a population of more than 3,716,000 discharging into the Delaware Basin. One hundred ninety-two sewage treatment plants serve a population of more than 1,651,000.

Industrial wastes are discharged directly to the streams from 406 sources, of which 289, or 71 percent produce organic wastes. One hundred nine establishments of those producing organic wastes also produce inorganic wastes. Inorganic wastes are discharged from 208 establishments.

The Delaware River Basin contains four zones as established by the Interstate Commission on the Delaware River Basin, the Lehigh River Sub-Basin, and the Schuylkill River Sub-Basin. Zone 1 is that part of the Delaware River and its West Branch extending from the New York-Pennsylvania boundary line to the head of tidewater at Trenton; Zone 2 from Trenton to the mouth of Pennypack Creek in Philadelphia; Zone 3, from Pennypack Creek to the Pennsylvania-Delaware boundary line; and Zone 4, from the Pennsylvania-Delaware boundary line to the Atlantic Ocean.

The Lehigh River discharges into Zone 1 and the Schuylkill River into Zone 3.

It is estimated that more than 60 percent of the pollution load is discharged in the Philadelphia-Camden Metropolitan Area, where the Delaware River is grossly polluted. The Schuylkill River is overloaded with domestic and industrial pollution. Approximately 40 million tons of silt from coal operations deposited in this stream during the past 100 years, at places with a depth of 26 feet, is being removed in the Schuylkill River Restoration Project and desilting facilities have been installed at 47 active anthracite washeries. Other significant areas of pollution along the Delaware are at Port Jervis, the Easton-Phillipsburg Area, and Wilmington.

Pollution Prevention Measures in Effect

One hundred ninety-two sewage treatment plants are provided for treating the waste waters from 189 municipal sources which serve a population of more than 1,651,000 or about 44 percent of the sewered population in the basin. Those provided with treatment facilities consist of approximately 1,068,700 with primary treatment, and 583,000 with secondary treatment.

Industrial waste treatment facilities are provided at 199 establishments or 49 percent of those which are sources of pollution within the basin. No waste treatment facilities are provided for 177 plants or about 44 percent of the establishments and the situation at the remaining seven percent of the establishments is undetermined. The majority of the sources of industrial pollution consist primarily of establishments related to food and kindred products, petroleum and coal products, metal products, textiles, and chemical and allied industries. About 53 percent of the sources of industrial wastes are concentrated in Zone 3, with 21 percent in Zone 1, 20 percent in Zone 4 and six percent in Zone 2.

Adequacy of Existing Treatment Facilities

Of the existing 192 municipal sewage treatment plants, 115 serving approximately 451,200 persons are of adequate capacity; 43 plants serving about 1,001,300 persons are unsatisfactory; while the capacities of 34 plants serving about 199,180 people are undetermined. One hundred forty-four of the sewage treatment plants serving about 866,800 are operated in a satisfactory manner while the operation of the remaining 48 plants are either unsatisfactory or undetermined.

Table A. Sources of pollution, municipal*, Delaware River Basin

Municipalities**	Sources of pollution (in number of municipalities)	Population served by sewerage system	Amount of pollution discharged to watercourse (in terms of equivalent number of people)***
Having data on pollution load discharged to watercourse	226	3,465,743[a]	3,249,870
Having population data available (Data on pollution load to watercourse incomplete or not available)	89	250,957[b]	Not applicable
Total	315	3,716,700[c]	--

*The data appearing in this and the subsequent tables for this sub-basin are summations of readily available information. In some cases the data are incomplete. Further, arrangement of data in these tables is difficult because many municipalities have multiple outlets, many of the existing treatment facilities serve several municipalities, and in some cases several treatment plants serve a single municipality. Accordingly, in comparing the tables minor irregularities may become apparent.

In subsequent reports, these inconsistencies will disappear as field investigations are made and the more complete information is obtained.

**Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

***Includes industrial wastes discharged into municipal sewerage systems.

[a] Population data available for 225 sources.

[b] Population data available for 55 sources.

[c] Population data available for 280 sources.

Progress in Pollution Abatement

During the years 1946 to 1949 inclusive, 20 sewage treatment plants were completed to serve a population of 89,640. Construction to date, during 1950, consists of five additional sewage treatment plants serving a population of 10,400, and the Northeast Plant in Philadelphia to serve 876,000 people. The trends in sewage construction since 1920 are shown in the graph--"growth in Sewage Treatment".

In the Philadelphia-Camden Metropolitan Area considerable progress is being made in sewage treatment projects. The City of Philadelphia is actively proceeding with the construction of three sewage treatment projects to be completed by the end of 1953, or early in 1954, at an estimated cost of $60,000,000, and the City of Camden is proceeding with a three-year sewage treatment program which will cost about $17,000,000.

During the years 1946 to 1949 inclusive 74 industrial waste treatment works have been completed. Since 1944 approximately 35 industries in the Philadelphia District have spent $25,000,000 in construction of treatment works and 50 additional industries have spent approximately $1,220,000 in independent action to abate pollution or provide treatment facilities. The refineries in southeastern Pennsylvania have a $7,000,000 pollution control program of which $4,000,000 in construction is underway. During 1947 to 1949 inclusive 47 operating anthracite collieries on the headwaters of the Schuylkill River have installed desilting basins which are removing thousands of tons of coal which otherwise would be discharged to the streams.

Pollution Prevention Measures Required

New or improved sewage treatment plants are required for 159 municipalities to serve a population of approximately 3,274,000 and 225 industrial establishments need improved or new industrial waste treatment facilities. Requirements are undetermined for 40 municipalities and 47 industrial establishments discharging waste waters to the streams.

The status of treatment works to abate pollution in the Delaware River Basin is set forth in table H. A list of project requirements by sub-basins is shown in tables I.

Table B. Sources of pollution, industrial*
Delaware River Basin

Industries	Sources of pollution (in number of plants)	Amount of pollution discharged to watercourse (in terms of equivalent number of people)
Producing organic wastes	126 [a]	1,969,429
Producing organic wastes	163 [b]	Undetermined
Producing inorganic wastes	208	Not applicable
Producing wastes of undetermined type	18	Undetermined
Total	406 [c]	--

*Industries having separate outlets and discharging wastes directly to watercourse.

[a] Includes 58 plants also producing inorganic wastes.

[b] Includes 51 plants also producing inorganic wastes.

[c] Total adjusted to correct for duplication noted in footnotes a and b.

Table C. Existing facilities, municipal,
Delaware River Basin

Degree of treatment provided	Number		Population served
	Municipalities*	Plants	
Primary	58	58	1,068,681 [a]
Secondary	131	133	582,992 [b]
No treatment	121	--	2,065,027 [c]
Total	310 [d]	192	3,716,700 [e]

*Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

[a] Population data available for 54 municipalities.

[b] Population data available for 120 municipalities.

[c] Population data available for 104 municipalities.

[d] Includes 2 municipalities listed as 7 sources of pollution in table A.

[e] Population data available for 278 municipalities (280).

Table D. Existing treatment facilities, industrial*, Delaware River Basin

Type industry	Number of plants	Number of industrial plants having:		
		Treatment facilities	No treatment facilities	Undetermined facilities
Food and kindred products...............	115	38	59	18
Textile mill products...............	52	18	29	5
Lumber and wood products...............	2	--	1	1
Paper and allied products...............	31	18	12	1
Chemical and allied products...............	26	10	16	0
Petroleum and coal products...............	23	15	7	1
Rubber products..........	3	0	3	0
Leather and leather products...............	1	0	1	0
Primary metals...........	8	7	1	0
Fabricated metals........	56	20	33	3
Mining...................	55	54	1	0
Miscellaneous............	34	19	14	1
Total..................	406	199	177	30

*Industries having separate outlets and discharging wastes directly to watercourse.

Table E. Adequacy of existing treatment facilities, Delaware River Basin

Existing treatment facilities	Number	Adequacy with relation to:					
		Capacity			Operation		
		Satis-factory	Unsatis-factory	Unde-termined	Satis-factory	Unsatis-factory	Unde-termined
Municipal	192 [a]	115 [b]	43 [c]	34 [d]	144 [e]	11 [f]	37 [g]
Industrial	199	115	41	43	123	34	42

[a] Population data available for 176 sources (174 municipalities) serving 1,651,673.

[b] Population data available for 104 sources serving 451,150.

[c] Population data available for 40 sources serving 1,001,341.

[d] Population data available for 32 sources serving 199,182.

[e] Population data available for 130 sources serving 866,789.

[f] Population served 565,653.

[g] Population data available for 35 sources serving 219,231.

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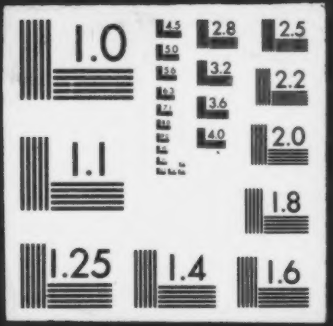
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Table D. Existing treatment facilities, industrial*, Delaware River Basin

Type industry	Number of plants	Number of industrial plants having:		
		Treatment facilities	No treatment facilities	Undetermined facilities
Food and kindred products	115	38	59	18
Textile mill products	52	18	29	5
Lumber and wood products	2	--	1	1
Paper and allied products	31	18	12	1
Chemical and allied products	26	10	16	0
Petroleum and coal products	23	15	7	1
Rubber products	3	0	3	0
Leather and leather products	1	0	1	0
Primary metals	8	7	1	0
Fabricated metals	56	20	33	3
Mining	55	54	1	0
Miscellaneous	34	19	14	1
Total	406	199	177	30

*Industries having separate outlets and discharging wastes directly to watercourse.

Table E. Adequacy of existing treatment facilities, Delaware River Basin

Existing treatment facilities	Number	Adequacy with relation to:					
		Capacity			Operation		
		Satisfactory	Unsatisfactory	Undetermined	Satisfactory	Unsatisfactory	Undetermined
Municipal	192 [a]	115 [b]	43 [c]	34 [d]	144 [e]	11 [f]	37 [g]
Industrial	199	115	41	43	123	34	42

[a] Population data available for 176 sources (174 municipalities) serving 1,651,673.

[b] Population data available for 104 sources serving 451,150.

[c] Population data available for 40 sources serving 1,001,341.

[d] Population data available for 32 sources serving 199,182.

[e] Population data available for 130 sources serving 866,789.

[f] Population served 565,653.

[g] Population data available for 35 sources serving 219,231.

Table F. Progress in pollution abatement, Delaware River Basin

Year	Municipal		Industrial	
	Plants completed	Design population	Plants completed[a]	Amount of waste treated (in terms of equivalent number of people)
1946	0	0	4	--
1947	2	5,260	14	--
1948	9	57,200	32	--
1949	9	27,180	24	--

[a] Industrial waste treatment plants completed include 47 anthracite collieries in the Schuylkill River Sub-Basin which have installed desilting facilities.

NOTE: Construction to date in 1950 consists of five additional sewage treatment plants serving a population of 10,400, the Northeast plant in Philadelphia to serve 876,000 people and 13 industrial waste treatment works.

Table G. Requirements for municipal and industrial waste treatment plants*, Delaware River Basin

Requirements	Municipal		Industrial
	Number	Population served by facilities	Number
New plant	82	2,057,565[a]	166[g]
Enlargement or additions to existing plant	66	679,540[b]	55
Replace existing plant	11	536,826[c]	4
No project required	112	434,057[d]	134
Undetermined	40	8,712[e]	47
Total	311	3,716,700[f]	406

*The needs set forth in this table are based on presently available information. However, future studies and evaluation may result in some changes in these needs.

[a] Population data available for 78 sources.

[b] Population data available for 63 sources.

[c] Population data available for 9 sources.

[d] Population data available for 101 sources.

[e] Population data available for 29 sources.

[f] Population data available for 280 sources.

[g] Includes 15 industrial establishments which may connect to municipal sewer systems.

Table H. Status of treatment works project to abate pollution, July 1, 1950, Delaware River Basin

Status of project	Number	
	Municipal	Industrial
No formal action	74	84
Abatement ordered	71	114
Plans under preparation	24	30
Final plans approved	41	24
Construction awaiting financing	--	--
Under construction	15	21
Status undetermined	2	40

Table I. List of Needed Projects, Sub-Basins of the Delaware River Basin

Municipalities and industries needing new or improved treatment facilities are tabulated on the following pages. "Municipalities" in the tabulations includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

The list is based upon information readily available pending completion of additional field surveys and investigations by the respective State water pollution control boards. It is admittedly incomplete but is believed to contain most of the significant sources of pollution. Consequently, the requirement "new plant" may upon future investigation indicate connection to city sewers, or other alternate requirements for industries and in some instances for small municipalities or areas contiguous to larger areas having treatment facilities.

Municipalities and industries desiring detailed information on problems affecting them are referred to their State water pollution control agency.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Zone I--Above Trenton Sub-Basin

Name	Population served	Project requirements	Remarks
New Jersey--Municipal:			
Mercer County Workhouse.......	200	Replace existing plant.	Final plans approved.
Phillipsburg..................	19,620	Replace existing plant.	Final plans approved.
Washington....................	5,280	Enlargement or addition to existing plant.	--
New York:			
Calicoon......................	200	New plant.	--
Deposit.......................	1,800	New plant.	Final plans approved 1947. Estimated cost--Sewers and treatment plant $262,360.
Fallsburg.....................	--	New plant.	--
Fleishmans....................	*W-500 **S-800	New plant.	--
Hancock.......................	1,500	New plant.	--
Hurleyville...................	*W-500 **S-2700	New plant.	Plans being prepared. Estimated cost--sewers and treatment plant $328,700.
Kauneonga Lake (White Lake)...	*W-300 **S-2,200	Enlargement or addition to existing plant.	Final plans approved 1949. Estimated cost: $70,000.
Kiamesha......................	*W-50 **S-1,500	Replace existing plant.	--
Lake Huntington...............	*W-200 **S-1,700	Enlargement or addition to existing plant.	Final plans approved 1950. Estimated cost $27,880.
Liberty (Town)................	--	New plant.	Plans complete. Estimated cost--sewers and treatment plant $132,120.
Livingston Manor..............	--	New plant.	--
Loch Sheldrake................	*W-200 **S-3,000	Enlargement or addition to existing plant.	Final plans approved 1949. Estimated cost $18,000.

*W=Winter.
**S=Summer.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Zone I--Above Trenton Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
Monticello	*W-4,000 **S-12,000	Enlargement or addition to existing plant.	Final plans approved 1949. Estimated cost $400,000.
Parkesville	--	New plant.	--
Port Jervis	10,000	New plant.	Final plans approved 1950. Estimated cost $1,750,000.
Roscoe	740	Enlargement or addition to existing plant.	Final plans approved 1935.
Sackett Lake	--	New plant.	Plans under preparation.
South Fallsburgh	*W-800 **S-9,000	Enlargement or addition to existing plant.	Final plans approved 1949. Estimated cost $80,000.
Stamford	*W-1,100 **S-3,500	Enlargement or addition to existing plant.	Final plans approved 1937. Estimated cost $28,000.
Stevensville (Swan Lake)	1,000	New plant.	--
Walton	3,500	New plant.	--
White Sulphur Springs	--	New plant.	Final plans approved 1949. Estimated cost sewers and treatment plant $125,750.
Woodbourne	*W-800 **S-3,200	New plant.	Estimated cost--sewers and treatment plant $387,000.
Youngsville	--	New plant.	--
Pennsylvania:			
Bangor	4,500	New plant.	Abatement ordered. Plans under preparation.
Delaware Water Gap	300	New plant.	Abatement ordered.
Easton	45,000	Enlargement or addition to existing plant.	Abatement ordered. Plans approved.
East Stroudsburg	3,700	Replace existing plant.	Plans completed.
East Stroudsburg Sewage Co	1,000	New plant.	Plans under preparation.
Honesdale	5,500	New plant.	Abatement ordered. Plans completed.
Matamoras	2,000	New plant.	Under construction.
Pen Argyl	1,500	New plant.	Abatement ordered.
Pocono Manor Assn	865	Enlargement or addition to existing plant.	--
Quakertown	3,600	Enlargement or addition to existing plant.	Abatement ordered.
Shawnee Inn, Inc	375	Enlargement or addition to existing plant.	Abatement ordered.
Skytop Lodge Inc	650	Enlargement or addition to existing plant.	--
Stroudsburg	6,500	Enlargement or addition to existing plant.	Abatement ordered.
New Jersey--Industrial:			
American Shoe Tanning Co., Newton	--	New plant.	--
Baker Chemical Co., Phillipsburg	--	New plant.	Abatement ordered.
Darlington Fabrics, Newton	--	New plant.	--
Riegel Paper Corp., Hughesville	--	New plant.	--
Riegel Paper Corp., Milford	--	New plant.	Abatement ordered.

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Zone I--Above Trenton Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
Riegel Paper Corp., Riegelsville	--	New plant.	Abatement ordered.
Riegel Paper Corp., Warren Glen	--	New plant.	--
Sussex Print and Dye Works, Inc., Newton	--	New plant.	--
New York:			
H. L. Adams Dairy, Walton	--	New plant.	--
Andes Co-op. Creamery, Inc., Andes	--	Enlargement or addition to existing plant.	--
Breakstone Sour Cream Plant, Walton	--	New plant.	--
Breakstone Bros., Youngville	--	Enlargement or addition to existing plant.	--
Delaware County Dairy Co., Delhi	--	New plant.	--
Delhi Dairy Co., Delhi	--	New plant.	--
Meadow Brook Dairy, Walton	--	New plant.	--
Meredith Inn Dairy, Delhi	--	New plant.	--
Meridale Dairies, Inc., Delhi.	--	New plant.	--
Mid State Packing Co., S. Kortright	--	Enlargement or addition to existing plant.	--
W. W. Schultz & Son, Greenville	--	Enlargement or addition to existing plant.	--
Vanlnwegen Farm, R.D., Port Jervis	--	New plant.	--
Pennsylvania:			
Rangor Mills, Inc., Pen Argyl.	1,476	New plant.	Abatement ordered.
Blue Ridge Textile Co., Bangor	550	Enlargement or addition to existing plant.	--
Bucks Co. Farm Dairies, Morrisville	--	--	Abatement ordered. May discharge to Morrisville sewer system.
Clemo Milk Products, Honesdale	400	New plant.	Abatement ordered.
Empire Box Co., Smithfield Township, Monroe County	--	Enlargement or addition to existing plant.	Abatement ordered.
Holland Mfg. Co., Stroudsburg	200	Replacing existing plant.	Abatement ordered.
Julius Kayser & Co., Bangor	2,660	Enlargement or addition to existing plant.	--
Keipers Home Laundry, Stroudsburg	--	Enlargement or addition to existing plant.	Abatement ordered. Negotiating to enter municipal sewer system.
Sheffield Farms, Inc., Preston Township, Wayne County	--	New plant.	Abatement ordered.

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Zone I--Above Trenton Sub-Basin--Continued

Name	Population served ***	Project requirements	Remarks
Starkey Farms Co., Falls Township, Bucks Co...	--	New plant.	Abatement ordered. Plans under preparation.
Stocker Bros. Dairy, Forks Township, Northampton County.........	250	New plant.	Abatement ordered.
Stroudsburg Sanitary Dairy, Stroudsburg................	48	Enlargement or addition to existing plant.	Abatement ordered.
Union Mills Paper Co., New Hope..................	--	Enlargement or addition to existing plant.	Abatement ordered.
Lehigh River Sub-Basin			
Pennsylvania--Municipal:			
Bethlehem....................	50,000	New plant.	Abatement ordered. Plans under preparation.
Catasauqua..................	1,000	New plant.	Abatement ordered. Plans under preparation.
E. Mauch Chunk...............	3,000	New plant.	Abatement ordered. Under construction.
Hazleton.....................	23,000	New plant.	Plans completed.
Hellertown...................	2,000	--	Abatement ordered. Will discharge into Bethlehem system.
Lehighton....................	1,000	New plant.	Abatement ordered. Plans completed.
Mauch Chunk..................	2,500	New plant.	Abatement ordered. Under construction.
Nesquehoning.................	5,000	New plant.	--
Northampton..................	4,800	Enlargement or addition to existing plant.	Abatement ordered.
North Catasauqua.............	500	--	Joint treatment with Catasauqua.
Palmerton Disposal Co........	7,500	Replace existing plant.	--
White Haven..................	1,200	New plant.	Abatement ordered. Under construction.
Pennsylvania--Industrial:			
The Baer Co., Lehighton......	--	New plant.	To enter municipal sewer system.
Concentrated Coal Co., Mauch Chunk Township, Carbon Co..................	--	Enlargement or addition to existing plant.	--
Delaware Dyeing & Finishing Co., Wilson................	--	New plant.	Abatement ordered. Negotiating to enter municipal sewer system.
Drifton Anthracite, L. Towamensing Township, Carbon Co..................	--	Enlargement or addition to existing plant.	Abatement ordered.
Eagle Brewing Co., Catasauqua.................	1,000	New plant.	--

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Lehigh River Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
Forrest Piece Dye Works, Easton	--	New plant.	Abatement ordered. Plans under preparation.
Gerstlauer Dairy, Lehighton	--	New plant.	To enter municipal sewer system.
L. F. Grammes & Sons, Allentown	--	New plant.	Abatement ordered.
Heintzelman Bros., S. Lehighton	--	New plant.	Abatement ordered.
Lehigh River Steam Coal Co., Lehigh Township, Northampton Co	--	Enlargement or addition to existing plant.	Abatement ordered.
Long Valley Rug Co., Longswamp Township, Berks Co	--	New plant.	Abatement ordered.
New Jersey Zinc of Pa., Palmerton	--	Enlargement or addition to existing plant.	Abatement ordered.
Penn Lace Co., Lehighton	--	New plant.	To enter municipal sewer system.
Sandy Run Mines & Producers Corp., Butler Township, Luzerne Co	--	Enlargement or addition to existing plant.	--
Superior Metal Co., Bethlehem	--	New plant.	Abatement ordered.
Trojan Powder Co., S. Whitehall Township, Lehigh Co	--	New plant.	Abatement ordered.
United Dyeing & Finishing Co., Catasauqua	--	New plant.	Abatement ordered. Plans under preparation.
C. K. Williams, Washington Township, Lehigh Co	--	New plant.	--
Zone 2--Trenton to Pennypack Creek Sub-Basin			
New Jersey--Municipal:			
Bordentown	4,800	Addition to existing plant.	Chlorination required.
Burlington	12,300	Enlargement or addition to existing plant.	Abatement ordered.
Florence Township (Florence Sect.)	4,000	Enlargement or addition to existing plant.	Abatement ordered.
Millside Farms Riverside	--	Replace existing plant.	--
Riverside Township (Riverside Section)	7,970	Enlargement or addition to existing plant.	Abatement ordered.
Trenton	141,800	Enlargement or addition to existing plant.	Abatement ordered.
Pennsylvania:			
Bristol	17,000	Enlargement or addition to existing plant.	Abatement ordered. Final plans approved.

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Zone 2--Trenton to Pennypack Creek Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
Byberry State Hospital, Philadelphia	7,000	Enlargement or addition to existing plant.	Abatement ordered. Under construction.
Lansdale	3,000	Enlargement or addition to existing plant.	Abatement ordered.
National Agricultural College Doylestown Township, Bucks Co	250	Enlargement or addition to existing plant.	Abatement ordered. Plans approved.
New Jersey--Industrial:			
Ankokas Dyeing & Processing, Mt. Holly	--	New plant.	--
Eagle Dyeing & Finishing Co., Mt. Holly	--	New plant.	--
Florence Thread Co., Riverside	--	New plant.	Plans under preparation. Pretreatment and discharge to municipal system.
Keystone Watch Case Co., Riverside	--	New plant.	Plans under preparation. Pretreatment and discharge to municipal system.
Riverside Metals Co., Riverside	--	New plant.	Plans under preparation. Pretreatment and discharge to municipal system.
Stokes Canning Co., Vincentown	--	Enlargement or addition to existing plant.	Abatement ordered.
Pennsylvania:			
Eppinger & Russell Co., Bensalem Township, Bucks Co	--	New plant.	Abatement ordered.
Hillcrest Dairy, Bensalem Township, Bucks Co	--	New plant.	Abatement ordered.
Zone 3--Pennypack Creek to Delaware State Line Sub-Basin			
New Jersey--Municipal:			
Camden	--	New plant.	Plans submitted.
Camden	--	Baldwins Run plant addition.	Under construction.
Camden	--	Fairview Section replacement.	--
Collingswood	14,420	Enlargement or addition to existing plant.	--
Gloucester	15,570	New plant.	Under construction.
Haddonfield	11,080	Enlargement or addition to existing plant.	--
Haddon Township (Westmont Section)	1,700	Replace existing plant.	--

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Zone 3--Pennypack Creek to Delaware State Line Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
Haddon Township (Guthbert Road Section) (W. Collingswood Section)...	4,600	Enlargements or addition to existing plants.	--
Merchantville--Pennsauken.....	18,000	Enlargement or addition to existing plant.	Final plans approved.
Mount Ephraim..................	2,600	Enlargement or addition to existing plant.	--
Palmyra........................	5,900	Enlargement or addition to existing plant.	--
Riverton.......................	3,675	New plant.	Abatement ordered.
Swedesboro.....................	2,420	New plant.	--
Westville......................	3,820	Enlargement or addition to existing plant.	--
Woodbury Heights..............	1,210	Enlargement or addition to existing plant.	--
Pennsylvania:			
Central Delaware County Authority....................	47,300	New plant.	Abatement ordered. Will serve 8 municipalities.
Cheyney State Teachers College......................	490	Enlargement or addition to existing plant.	Abatement ordered. Under construction.
Darby Creek Joint Authority...	70,000	New plant.	Abatement ordered. Final plans approved. Will serve 13 municipalities.
Delaware County Home..........	325	Enlargement or addition to existing plant.	Under construction.
Glen Mills Girls School.......	560	Enlargement or addition to existing plant.	Plans under preparation.
Hatboro Borough Upper Moreland Township.....	7,000	Enlargement or addition to existing plant.	Under orders. Plans for additions completed. Estimated cost--sewers and additional treatment, $483,900
Marcus Hook...................	7,000	New plant.	Abatement ordered. Has joined the Lower Delaware County Sewer Authority.
Muckinapattus Creek Authority.	16,800	New plant.	Abatement ordered. Final plans approved. Will serve 9 municipalities.
Philadelphia--			
Northeast plant.............	500,000	Replacement.	Under construction.
Southeast plant.............	677,000	New plant.	Under construction.
Southwest plant.............	731,000	New plant.	Under construction.
Radnor-Haverford..............	13,500	Enlargement or addition to existing plant.	--
West Chester (Goose Creek Plant).........	6,000	Enlargement or addition to existing plant.	Has complete treatment type plant. Under orders for additional facilities.

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Zone 3--Pennypack Creek to Delaware State Line Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
New Jersey--Industrial:			
Calco Chemical Co., Gloucester..................	10,900	New plant.	Abatement ordered. Pilot plant studies being conducted.
E. I. duPont de Nemours Co., Greenwich Township (Gibbstown Section).........	3,400	New plant.	--
E. I. duPont de Nemours Co., Paulsboro...................	250	New plant.	--
Harshaw Chemical Co., Gloucester..................	330	New plant.	--
Edgar F. Hurff Co., Swedesboro..................	--	New plant.	--
Kieckhefer Container Corp., Pennsauken Township.........	34,500	New plant.	--
MacAndrews & Forbes Co., Camden......................	--	New plant.	--
Morgan Bros. Laundry Haddon Township (Westmont Section)..........	2,086	New plant.	--
Ruberoid Co., Gloucester......	39,000	New plant.	Abatement ordered. Pilot plant studies being conducted.
I. P. Thomas Co., Paulsboro...	--	New plant.	--
Pennsylvania:			
American Engineering Co., Philadelphia................	--	--	Negotiating to enter municipal sewer system.
American Metal Specialty Corp., Hatboro..............	--	--	Negotiating to enter municipal sewer system.
American Viscose Corp., Marcus Hook.................	--	New plant.	Abatement ordered. Under construction.
Anchor Dyeing & Finishing Co., Philadelphia................	--	--	Negotiating to enter municipal sewer system.
Baxter, Kelly & Faust, Inc. Philadelphia................	--	--	Negotiating to enter municipal sewer system.
Bers & Co., Philadelphia......	--	--	Negotiating to enter municipal sewer system.
George Brown & Sons, Inc., Middletown Township, Delaware County.............	--	New plant.	Abatement ordered.
Coastal Tank Lines, Marple Township, Delaware County.............	--	--	Abatement ordered.
Delta Company, Philadelphia...	--	--	Negotiating to enter municipal sewer system.
Henry Disston & Sons, Inc., Philadelphia................	--	New plant.	Abatement ordered. Under construction.

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Zone 3--Pennypack Creek to Delaware State Line Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
Eddystone Mfg. Co., Eddystone.	--	New plant.	Abatement ordered. Final plans approved.
Grocery Store Products Co., W. Goshen Township, Chester County..............	--	New plant.	Abatement ordered. Plans under preparation.
Hellwig Silk Dyeing Corp., Philadelphia................	--	--	Negotiating to enter municipal sewer system.
Horrocks & Brothers, Philadelphia................	--	--	Negotiating to enter municipal sewer system.
Mazer Paper Co., Upper Darby..	--	Enlargement or addition to existing plant.	Plans under preparation. Negotiating to enter municipal sewer system.
Paper Products Mfg. Co., Nether Providence Township, Delaware County............	--	Enlargement or addition to existing plant.	Abatement ordered.
Penn Steel Casting Co., Chester.....................	--	--	Negotiating to enter municipal sewer system.
Pennsylvania Forge Corp., Philadelphia...............	--	--	Negotiating to enter municipal sewer system.
Philadelphia Coke Co., Philadelphia...............	--	Enlargement or addition to existing plant.	Abatement ordered. Negotiating to enter municipal sewer system.
Philadelphia Electric Co., Chester....................	--	--	Negotiating to enter municipal sewer system.
Philadelphia Gas Works, Philadelphia...............	--	Enlargement or additions to existing plant.	Abatement ordered. Plans approved.
Chas. R. Shoemaker, Philadelphia...............	--	--	Negotiating to enter municipal sewer system.
Standard Pressed Steel Co., Jenkintown................	--	Enlargement or addition to existing plant.	Plans submitted for approval.
A. M. Townson & Co., Inc., Philadelphia...............	--	--	Negotiating to enter municipal sewer system.
F. W. Tunnell & Co., Inc., Philadelphia...............	--	--	Negotiating to enter municipal sewer system.
Yorkshire Worsted Mills, Aston Township, Delaware Co................	--	New plant.	Abatement ordered. Plans under preparation.
Schuylkill River Sub-Basin			
Pennsylvania--Municipal:			
Ambler........................	4,500	Enlargement or addition to existing plant.	Abatement ordered.

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Schuylkill River Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
Bridgeport	5,000	Enlargement or addition to existing plant.	Abatement ordered. Plans approved.
Brockton	450	New plant.	Abatement ordered.
Coaldale State Hospital	200	--	Will discharge to system of Panther Valley Sewer Authority.
Conshohocken	9,800	Enlargement or addition to existing plant.	Abatement ordered. Plans approved.
Cressona	1,000	New plant.	Abatement ordered. Plans approved.
Cumbola	1,500	New plant.	Abatement ordered.
Eastern State Pepitentary	2,160	Enlargement or addition to existing plant.	--
Fleetwood	500	New plant.	Plans under preparation.
Hamburg	1,200	New plant.	Abatement ordered. Plans approved.
Homestown	220	New plant.	Plans under preparation.
House of Good Shepherd, Reading	200	Enlargement or addition to existing plant.	Negotiating to enter municipal sewer system.
Laureldale	500	New plant.	Final plans approved.
Middleport	1,080	New plant.	Abatement ordered. Plans under preparation.
Minersville	6,000	New plant.	Abatement ordered.
Mohnton	900	New plant.	Abatement ordered. Plans under preparation.
New Philadelphia	2,000	New plant.	Abatement ordered. Plans under preparation.
Norristown	51,000	Enlargement or addition to existing plant.	Abatement ordered. Under construction.
Orwigsburg	1,000	New plant.	Abatement ordered.
Palo Alto	1,900	New plant.	Abatement ordered. Plans under preparation.
Panther Valley Combined Sewer Commission--			
Coaldale	6,200	New plant.	Abatement ordered. Plans under preparation.
Lansford	8,700	New plant.	Abatement ordered. Plans under preparation.
Summit Hill	5,400	New plant.	Abatement ordered. Plans under preparation.
Perkasie Sewer Co. and Sellersville	8,115	Enlargement or addition to existing plant.	Abatement ordered. Plans under preparation.
Phoenixville	12,500	Enlargement or addition to existing plant.	Abatement ordered.
Port Carbon	3,000	New plant.	Abatement ordered.
Pottstown	24,450	Enlargement or addition to existing plant.	Abatement ordered. Plans approved.
Pottsville	24,530	New plant.	Abatement ordered. Plans under preparation.
Reading	90,000	Enlargement or addition to existing plant.	Abatement ordered. Plans under preparation.
Reading Garbage Treatment Plant	P.E. 11,900	New plant.	Abatement ordered.
Royersford	3,000	Enlargement or addition to existing plant.	Abatement ordered. Plans approved.

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Schuylkill River Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
Schuylkill Co. Institutional District......	450	Enlargement or addition to existing plant.	Abatement ordered.
Schuylkill Haven..............	4,000	New plant.	Abatement ordered. Under construction.
Shillington...................	500	New plant.	Abatement ordered. Under construction.
Spring City...................	3,100	Enlargement or addition to existing plant.	Abatement ordered.
St. Clair.....................	3,000	New plant.	Abatement ordered.
Tamaqua.......................	10,000	New plant.	Abatement ordered. Plans under preparation.
Tuscarora.....................	800	New plant.	Abatement ordered. Plans under preparation.
Wyomissing Valley Joint Municipal Authority (Wyomissing and West Reading)....................	4,500	Replace existing plant.	Abatement ordered.
Pennsylvania--Industrial:			
G. W. Alexander Co., Inc., W. Reading..................	4,000	New plant.	Abatement ordered. Negotiation to enter system of Wyomissing Valley Authority.
Aluminum Co. of America, Cressona....................	200	New plant.	Abatement ordered. Negotiating to enter municipal sewer system.
Floyd Artz, Branch Township, Schuylkill Co..............	25	New plant.	Abatement ordered. Plans under preparation.
Atlas Powder Co., Reynolds Plant, Walker Township, Schuylkill Co..............	--	New plant.	Abatement ordered. Final plans approved.
Auburn Coal Co., S. Manheim Township, Schuylkill Co..............	--	New plant.	Plans under preparation.
Barrett Co., Philadelphia.....	--	New plant.	--
Berks Dyeing & Finishing Co., Mohnton.....................	537	Enlargement or addition to existing plant.	--
Bowers Battery & Plug Mfg. Co., Muhlenberg Township, Berks Co....................	--	New plant.	Abatement ordered. Final plans approved.
A. J. Brumback Inc., Exeter Township, Berks Co....................	445	New plant.	Abatement ordered. Final plans approved.
Cacoosing Dairy, West Lawn....	400	Enlargement or addition to existing plant.	Abatement ordered.
Carpenter Steel Co., Reading..	--	New plant.	Abatement ordered.

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Schuylkill River Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
City Laundry, L. Alsace Township, Berks Co....................	607	New plant.	Abatement ordered.
Consumer Gas Co., Reading.....	--	New plant.	Abatement ordered. Negotiating to enter municipal sewer system.
Continental Diamond Fibre Co., Bridgeport..................	--	Enlargement or addition to existing plant.	Under construction.
Daring Paper Mfgrs. Inc., Bridgeport..................	--	New plant.	Abatement ordered. Under construction.
Degers Dairy, U. Providence Township, Montgomery Co.....	--	New plant.	Abatement ordered. Plans under preparation.
De Soi Plating Works, N. Coventry Township, Chester Co..................	--	New plant.	Under construction.
Doehler-Jarvis Co., Pottstown...................	--	New plant.	Abatement ordered. Under construction.
East Greenvile Dairy, East Greenville.............	--	New plant.	Abatement ordered.
Elmer C. Ebling, Myerstown....	45	New plant.	Abatement ordered. Plans under preparation.
Esterley Woolen Co., Exeter Township, Berks Co....................	7,660	New plant.	Abatement ordered. Final plans approved.
Farmers Fairfield Dairy Co., Muhlenberg Township, Berks Co....................	500	New plant.	Abatement ordered.
Firestone Tire & Rubber Co., L. Pottsgrove Township......	--	New plant.	Under construction.
Stanley G. Flagg, W. Pottsgrove Township, Montgomery Co...............	--	New plant.	Abatement ordered. Under construction.
Fleetwood Dairy, Fleetwood....	1,500	New plant.	Abatement ordered. Negotiating to enter municipal sewer system.
Floyd Wells Co., Royersford...	--	New plant.	Negotiating to enter municipal sewer system.
French Creek Granite Co., Warwick Township, Chester Co..................	--	Enlargement or addition to existing plant.	Abatement ordered.
Glassing Paper Co., Conshohocken................	--	--	Plans under preparation.
Gudebrode Co., Inc., W. Pottsgrove Township, Montgomery Co...............	--	Enlargement or addition to existing plant.	Abatement ordered. Under construction.
Gulf Refining Co., Philadelphia................	--	Enlargement or addition to existing plant.	Abatement ordered. Under construction.

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Schuylkill River Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
Heffners Meat Market, Schuylkill Haven............	100	New plant.	Abatement ordered. Negotiating to enter municipal sewer system.
W. H. Hendel Inc., Cumru Township, Berks Co....................	480	Enlargement or addition to existing plant.	Abatement ordered.
Industrial Hosiery Mills Co., Inc., Mohnton..............	1,000	Enlargement or addition to existing plant.	Plans under preparation.
Jac Coal Co., Norwegian Township, Schuylkill Co...............	--	Enlargement or addition to existing plant.	Plans under preparation.
Harvey B. Kerns, W. Leesport..	284	New plant.	Abatement ordered. Under construction.
K.M. & F. Coal Service, Middleport..................	--	Enlargement or addition to existing plant.	--
Krasley Bleach & Dye Works, Royersford..................	2,300	New plant.	Negotiating to enter municipal sewer system.
Landy Towel & Linen Service Co., Reading................	523	New plant.	Abatement ordered.
James Lee & Sons Co., Bridgeport..................	37,500	New plant.	Abatement ordered. Plans under preparation.
Karl Lieberknecht Inc., Laureldale..................	--	New plant.	Abatement ordered. Plans under preparation.
Chas. Lockman Co., Inc., Phoenixville................	--	New plant.	Abatement ordered. Negotiating to enter municipal sewer system.
Longacres Dairy, Washington Township, Berks Co....................	75	New plant.	Abatement ordered.
Merion Worsted Mills, W. Conshohocken............	--	Enlargement or addition to existing plant.	Abatement ordered.
C. D. Moyer Co., Hilltown Township, Bucks Co....................	--	New plant.	Abatement ordered.
New Perkiomen Laundry, E. Greenville...............	--	New plant.	Abatement ordered.
N.Y. Coil Co., Inc., U. Providence Township, Montgomery Co...............	--	New plant.	Plans under preparation.
Norristown Magnesia and Asbestos, Norristown........	--	New plant.	Abatement ordered. Under construction.
Penn Hardware Co., Reading....	--	New plant.	Abatement ordered. Negotiating to enter municipal sewer system.

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Schuylkill River Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
Philadelphia Dairy Products Co., Pottstown	--	New plant.	Abatement ordered. Negotiating to enter municipal sewer system.
Philadelphia Electric Co., W. Conshohocken	--	Enlargement or addition to existing plant.	Abatement ordered.
Philadelphia Gas Works Co., Philadelphia	--	New plant.	Abatement ordered.
Phoenix Iron & Steel Co., Phoenixville	--	New plant.	Abatement ordered. Plans under preparation.
Pittsburg Screw & Bolt Corp., Plymouth Township, Montgomery Co	--	New plant.	Abatement ordered.
Pottsville Bleaching & Dyeing Co., Port Carbon	1,500	New plant.	Abatement ordered. Negotiating to enter municipal sewer systems.
Price Battery Co., Hamburg	--	New plant.	Abatement ordered. Negotiating to enter municipal sewer system.
Reading Tube Corp., Reading	--	New plant.	Abatement ordered.
Reilly, Whiteman & Woltan Co., Whitemarsh Township, Montgomery Co	--	Enlargement or addition to existing plant.	Abatement ordered. Plans under preparation.
R. W. Rath, Schuylkill Haven	400	New plant.	Abatement ordered. Negotiating to enter municipal sewer system.
Schuylkill Haven Bleach & Dye Works, Schuylkill Haven	500	New plant.	Negotiating to enter municipal sewer system.
T. M. Seasholtz & Son, Inc., Reading	--	New plant.	Abatement ordered. Negotiating to enter municipal sewer system.
Sharpe & Dohme Inc., Upper Gwynedd Township, Montgomery Co	--	New plant.	--
Paul B. Shearer Co., Center Township, Berks Co	900	New plant.	Abatement ordered. Plans under preparation.
Spring City Bleach & Dye Works, Spring City	--	New plant.	Abatement ordered. Under construction.
Tamaqua Laundry & Cleaning Co., Tamaqua	320	New plant.	Abatement ordered. Negotiating to enter municipal sewer system.
Taylor Fibre Co., W. Norriton Township, Montgomery Co	--	Enlargement or addition to existing plant.	Abatement ordered. Under construction.

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Schuylkill River Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
Walker Bros., Whitemarsh Township, Montgomery Co..............	--	Enlargement or addition to existing plant.	Abatement ordered. Under construction.
Wolfe Dye & Bleach Works, Perry Township, Berks Co...................	--	New plant.	Abatement ordered. Plans under preparation.
Alan Wood Steel Co., Schuylkill Iron Works Div., Conshohocken...............	--	New plant.	Abatement ordered. Under construction.
Alan Wood Steel Co., Upper Merion Township, Montgomery Co..............	--	Enlargement or addition to existing plant.	Abatement ordered. Plans under preparation.
John Wood Mfg. Co., Conshohocken...............	--	New plant.	Abatement ordered. Under construction.
Woodson Dairy, Red Hill......	--	New plant.	Abatement ordered.
Zone 4--Below Delaware State Line Sub-Basin			
Delaware--Municipal:			
Bellefonte....................	5,000	New plant.	--
Bellevue......................	2,000	New plant.	--
Camden........................	680	New plant.	--
Claymont......................	1,700	New plant.	--
Clayton.......................	800	Replace existing plant.	--
Delaware City.................	800	New plant.	--
Delaware Race Track..........	--	Enlargement or addition to existing plant.	--
Dover.........................	6,000	Enlargement or addition to existing plant.	--
Frederica.....................	640	New plant.	--
Lewes.........................	1,750	New plant.	Plans completed.
Milford.......................	4,200	Enlargement or addition to existing plant.	--
Milton........................	1,200	New plant.	--
New Castle....................	3,500	New plant.	--
Newport.......................	990	New plant.	--
Red Clay Plant...............	4,060	Enlargement or addition to existing plant.	--
Richardson Park Plant........	15,000	Enlargement or addition to existing plant.	--
Smyrna........................	1,750	New plant.	--
Stanton.......................	800	Enlargement or addition to existing plant.	--
Welfare Home, Smyrna.........	300	Enlargement or addition to existing plant.	--
Wilmington....................	110,000	New plant.	Plans completed.
Wyoming.......................	870	New plant.	--
New Jersey:			
Bridgeton.....................	18,300	Enlargement or addition to existing plant.	--

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Zone 4--Below Delaware State Line Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
Cape May Point	--	Enlargement or addition to existing plant.	--
Salem	9,180	New plant.	--
Pennsylvania:			
Coatesville	16,000	Enlargement or addition to existing plant.	Abatement ordered.
Downingtown	4,000	Enlargement or addition to existing plant.	Abatement ordered. Final plans approved.
Parkesburg	2,290	Enlargement or addition to existing plant.	Abatement ordered.
West Chester (Taylor Run Plant)	7,500	Enlargement or addition to existing plant.	Abatement ordered.
Delaware--Industrial:			
Jos. Bancroft & Co., Wilmington	17,700	New plant.	--
Barkers Landing Canning Co.	12,000	New plant.	--
Chrysler Plant, Newark	560	Enlargement or addition to existing plant.	--
Cole Canning Co., Middletown.	2,400	New plant.	--
Crowell Corp., Yorklyn	--	New plant.	--
Curtis Paper Co., Newark	5,000	New plant.	--
C. Draper Bros. Cannery, Frederica	735	New plant.	--
Geo. Draper, Jr. Cannery, South east of Milford	--	New plant.	--
Draper Cannery, Milton	6,300	New plant.	--
DuPont Exp. Station, Wilmington	1,100	New plant.	--
Eagle Poultry Co., Frankford.	40,000	Enlargement or addition to existing plant.	--
Harrington Cannery, Harrington	2,450	New plant.	--
Hercules Experiment Station, Marshallton	1,350	Enlargement or addition to existing plant.	--
Jackson Rendering Co., Dover.	--	New plant.	--
Kenton Packing Co., Kenton	4,050	New plant.	--
Krebs Pigment Plant, Newport.	14,000	Enlargement or addition to existing plant.	--
Lewes Packing Co., Lewes	--	New plant.	--
Libby, McNeil & Libby, Houston	2,500	New plant.	--
Marshall Bros., Inc., Yorklyn	--	New plant.	--
Millsboro Poultry Co., Millsboro	18,500	Enlargement or addition to existing plant.	--
Nassau Creamery, Nassau	80	New plant.	--
National Vulcan Fibre, Newark	33,000	New plant.	--
National Vulcan Fibre, Yorklyn	--	New plant.	--

See reference at end of table.

Table I. Project list - municipalities and industries requiring inprovements for abatement of pollution, July 1, 1950, Zone 4--Below Delaware State Line Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
Paramount Poultry Co., Harbeson....................	19,000	Replace existing plant.	--
Phillips Cannery, Newark.....	12,000	Enlargement or addition to existing plant.	--
Phillips Packing Co., Townsend....................	2,700	New plant.	--
Roth Poultry Co., Milton.....	--	Enlargement or addition to existing plant.	--
San-Nap-Pak Mfg., Co., Rockland....................	35,000	Enlargement or addition to existing plant.	--
Scott-Powell Co., Clayton....	--	New plant.	--
Snowdens Slaughterhouse, Marshallton................	50	Enlargement or addition to existing plant.	--
St. Georges Canning Co., St. George.................	2,400	New plant.	--
Stockley Canning Co., Rehoboth...................	1,680	Enlargement or addition to existing plant.	--
Swift & Co., Felton..........	3,600	Enlargement or addition to existing plant.	--
Swift & Co., Georgetown......	1,500	Enlargement or addition to existing plant.	--
J. G. Townsend Canning Co., Georgetown..................	1,425	New plant.	--
Wadkins Canning Co., Odessa..	7,000	New plant.	--
Wheatley's Canning Co., Clayton....................	15,000	Enlargement or addition to existing plant.	--
Wood Preserving Co., Newport.	1,000	Enlargement or addition to existing plant.	--
Woodside Canning Co., Woodside....................	1,050	New plant.	--
New Jersey--Industrial:			
Bridgeton Gas Light Co., Bridgeton..................	3,000	New plant.	--
Deerfield Packing Co., Upper Deerfield Township...	64,000	Enlargement or addition to existing plant.	--
E. I. duPont de Nemours, Lower Penns Neck Township..	1,000,000	New plant.	Has compositing basin. Studies being made of pollution at sources to determine remedial measures.
E. I. duPont de Nemours, Upper Penns Neck Township..	1,000	New plant.	--
Wm. Lanning & Son Co., Bridgeton..................	38,100	New plant.	Has sedimentation.
Liggets Canning Co., Landisville Township.......	12,000	New plant.	Has sedimentation.
Martin Dyeing & Finishing Co., Bridgeton.............	87,750	New plant.	--
E. Pritchard, Inc., Bridgeton..................	32,800	New plant.	--

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Zone 4--Below Delaware State Line Sub-Basin--Continued

Name	Population served***	Project requirements	Remarks
P. J. Ritter Co., Inc., Bridgeton....................	34,600	New plant.	--
Shoemakers Dairy, Hopewell Township...........	680	New plant.	--
Pennsylvania:			
S. A. Bicking Paper Mfg. Co., Downington..................	--	Enlargement or addition to existing plant.	Abatement ordered.
Highland Dairy Products Co., W. Marlboro Township, Chester County..............	--	Replace existing plant.	Abatement ordered.
Keystone Mushroom Co., Valley Township, Chester County..............	--	Enlargement or addition to existing plant.	Plans under preparation.
V. Losita & Sons, New Garden Township, Chester County..............	--	Replace existing plant.	Abatement ordered. Plans under preparation.
Lukens Steel Co., Coatesville.	--	Enlargement or addition to existing plant.	Abatement ordered. Under construction.
National Vulcanized Fibre Co., Kennett Square..............	--	New plant.	Abatement ordered. Under construction..
A. D. Pierce, Kennett Township, Chester County..............	--	New plant.	Under construction.
Seabrook Farms Co., London Grove Township, Chester County..............	--	New plant.	Under construction.
Superior Canning Co., Avondale.....................	--	New plant.	Abatement ordered.
J. B. Swayne & Sons, Kennett Township, Chester County..............	--	New plant.	Abatement ordered.
Willow Brook Packing Co., West Goshen Township, Chester County..............	--	New plant.	Abatement ordered.

*W=Winter.
**S=Summer.
***Strength of industrial waste measured in terms of equivalent number of people.

SUSQUEHANNA RIVER BASIN

Sub-Basins
- North Branch--Susquehanna River
- West Branch--Susquehanna River
- Juniata River
- Main Stem--Susquehanna River

General Description

The Susquehanna River Drainage Basin is approximately 240 miles in length and has a maximum width of about 160 miles. It includes an area of 27,425 square miles. Approximately three-fourths of the drainage lies in Pennsylvania and covers 47 percent of the State's area; one-fourth lies in New York and covers about 13 percent of that State, with only a small area in Maryland at the head of Chesapeake Bay.

The principal drainage areas in square miles are approximately as follows:

North Branch	(New York	6,250
	(Pennsylvania	5,007
West Branch	Pennsylvania	6,913
Juniata River	Pennsylvania	3,426
Susquehanna	(Pennsylvania	5,571
Main Stem	(Maryland	258
	TOTAL:	27,425

The Susquehanna River is the largest stream entering the Atlantic Ocean in the United States. It is formed at the confluence of its North and West Branches at Northumberland, Pa., and flows southerly about 38 miles to the junction of the Juniata River; thence southeasterly for 91 miles to the Chesapeake Bay at Havre de Grace, Md.

The Susquehanna main stem between Northumberland and Harrisburg cuts through a series of parallel mountain ridges. The stream is wide and shallow and contains many rocky islands. About 23 miles north of the Pennsylvania-Maryland boundary it enters a gorge where it becomes narrow and rapid and is flanked by rocky bluffs.

The North Branch, which is approximately 315 miles in length, has its source in Otsego Lake in the Catskill Mountains in southeastern New York. It flows southwesterly through a hilly region about 62 miles entering Pennsylvania in Susquehanna County where it forms a loop 16 miles long, re-enters New York to flow westerly about 72 miles and finally returns to Pennsylvania near Sayre, Bradford County. It then flows southeasterly through a mountainous region about 90 miles to the junction of the Lackawanna River near Pittston, then southwesterly, about 75 miles in a narrow valley to its confluence with the West Branch.

The West Branch has its source in northwestern Cambria County, Pennsylvania and in general flows northeasterly in an area of high table lands about 200 miles to a point about ten miles east of Williamsport, then southerly for about 30 miles to join the North Branch to form the Susquehanna.

The Juniata River and its main branches is 194 miles in length. It is the principal tributary of the main stem Susquehanna. It lies wholly within the Allegheny Mountain region, flowing in a narrow valley between well-wooded ridges.

The topography of the basin is varied, since it lies in three main divisions: the northern portion in the Allegheny Plateau, the central portion in the Allegheny Mountains, and the lower portion in the rolling Piedmont Plateau. The upper portion is principally shale and sandstone outcrops. The central or mountainous region contains shale and sandstone. Anthracite deposits lie in the east. In the west, limestone deposits and numerous springs are found with flows estimated from 2,000 to 20,000 gallons per minute. The lower portion in the Piedmont Plateau region has extensive limestone valleys and formations of slate, sandstone and trap rock in the higher areas.

Average winter temperatures vary from 22°F. in the northern portion of the basin to 34°F. in the south, with corresponding average summer temperatures of 66°F. and 76°F. The average annual precipitation is approximately 40 inches in the northern part of the basin and 42 inches in the central and southern portions. Snowfall varies from 50 inches in the north to 35 to 40 inches in the south. Rainfall is ample, dependable, well distributed, and generally sufficient for agricultural needs.

Economic Development

The estimated population of the Susquehanna River Basin based upon the 1950 preliminary releases is approximately 3,157,000, an increase of about 73,000 since 1940, or a gain of two percent. The density is 115 people per square mile.

The nine principal cities in the basin are Altoona, Harrisburg, Lancaster, Scranton, Wilkes-Barre, Williamsport, and York in Pennsylvania; and Binghamton and Elmira in New York

Manufacturing industries of widely diversified products are generally scattered throughout the basin. Food products, steel, furniture and lumber, metal products, textiles, paper, chemicals, leather, glass, clay and stone products, and photographic supplies are produced.

Dairy farming predominates in the northern and north-central part of the basin, while diversified farming is carried on extensively in the central portion. The best agricultural lands are located in the southeastern section. Dairy products, tobacco, poultry and eggs, corn, wheat, potatoes, oats, maple sugar, and fruit crops are produced. Since 1900, there has been a general tendency for the number of farms to decline due primarily to the return of submarginal areas to reforestation and the expansion of urban and industrial development in these areas.

The production of anthracite is the major industry of the east-central part of the basin in Pennsylvania, where practically all of the anthracite used in the United States is mined. Bituminous coal is produced in the West Branch and Juniata Sub-Basins, and in limited amounts in a portion of the North Branch Sub-Basin. Natural gas is produced to a limited extent in the North Branch Sub-Basin.

Lumbering reached its peak about 1900 and has gradually declined. Existing forest growth is second growth timber. In the Pennsylvania portion there are about 8,000,000 acres of forest land, of which 18 percent is State Forest Land and contains 17 State Parks.

Uses of Water Resources

The majority of communities in the Susquehanna Basin do not obtain their water supply from the principal streams, but from impoundments on upland streams or from wells and springs. Most communities have adequate supplies of good quality. Surface streams supply 241 m. g. d. to 169 purveyors for 351 municipalities, serving about 1,858,000 persons. However, only nine municipalities using 16 m. g. d. and serving about 154,000 persons obtain their supply from the North or West Branches, or the main stem of the Susquehanna, the principal users being Berwick, Sayre, Columbia, and Steelton in Pennsylvania; and Binghamton, N. Y.

Ground water is generally available for domestic and limited industrial use. In the northern part of the basin the supplies are in general obtained from sandstone formations and are usually soft, while in the southern part they are derived from limestone formations and are usually hard. Wells and springs in the Susquehanna Basin supply 37 m. g. d. to 233 purveyors for 256 municipalities serving about 304,000 persons.

Power needs for the most part are supplied by steam plants, although the Susquehanna River has a large potential for water power developments. The three major existing hydroelectric plants are located on the lower Susquehanna at Safe Harbor and Holtwood in Pennsylvania, and at Conowingo, Md.

Pollution Contributed to Water Resources

There are 285 municipal sewer systems, serving a population of about 1,670,000 discharging into the Susquehanna Basin. Ninety sewage treatment plants serve a population of about 504,000.

Industrial wastes are discharged directly to the streams from 496 sources, of which 424, or 85 percent, produce organic wastes. Inorganic wastes are produced by 216 establishments including 153 which also produce organic wastes and the type of waste discharged from nine plants is undetermined. Hundreds of acid mine discharges are not included in these figures.

The North Branch receives pollution from about 41 percent of the entire number of municipal and 49 percent of the industrial sources within the Susquehanna Basin. It also receives acid mine drainage and culm from the Lackawanna River and other tributaries, which drain the anthracite region. The principal municipal sources of pollution which discharge sewage without treatment are Binghamton, Endicott, and Johnson City, N. Y. and Scranton and Wilkes-Barre, Pa., and numerous smaller municipalities in the Scranton-Wilkes Barre metropolitan area. The stream also receives about 60 tons of acid per day from bituminous coal workings in the northern part of Pennsylvania. Pollution conditions in the North Branch are particularly noticeable below the Lackawanna River and through the Scranton-Wilkes Barre district.

The West Branch receives pollution from about 23 percent of the municipal and eight percent of the industrial sources in the Susquehanna Basin. The principal municipal sources of pollution are Williamsport and Lock Haven. The West Branch, upstream from the vicinity of Lock Haven to its headwaters and the principal tributaries except Bald Eagle Creek, are decidedly acid due to mine drainage from the bituminous coal fields in the Clearfield region. There are probably 600 to 700 bituminous coal operations in this area from which a daily mine acid load of 480 tons is discharged creating

530 miles of acid polluted streams. Below Lock Haven the stream becomes alkaline due to the admixture of waters from Pine Creek and other streams.

The Juniata River receives pollution from about 13 percent of the municipal and three percent of the industrial sources in the Susquehanna Basin. The river receives pollution at its headwaters from the discharge of inadequately treated sewage from Altoona. It also receives pollution from municipal and industrial sources at Tyrone, Huntingdon, Mt. Union and Lewistown. There are about 60 miles of acid polluted streams in this basin resulting from the discharge of a mine acid load of 180 tons per day from bituminous coal operations.

The Susquehanna River from Northumberland to its mouth is wide and contains many rapids and ripples. It receives pollution from 26 percent of the municipal and 40 percent of the industrial sources in the entire Susquehanna Drainage Basin. Untreated sewage is discharged from Sunbury, Harrisburg, Steelton and Columbia along the main stem and from several large communities along tributaries in the anthracite region. The tributaries from the east above Harrisburg drain the anthracite region and carry considerable acid mine drainage and culm into the main stream. In the lower section the Codorus Creek from the west carries considerable pollution from the York area.

Pollution Prevention Measures in Effect

Ninety sewage treatment plants are provided for treating the waste waters from 89 municipal sources which serve a population of approximately 504,000 or about 30 percent of the sewered population in the basin; 232,000 with primary treatment and 272,000 with secondary treatment. In general the treatment plants are located along the smaller tributaries except those on the headwaters of the Juniata River. No treatment facilities are provided for 1,167,000 or 70 percent of the sewered population, which contribute pollution from 196 municipal sources.

Industrial waste treatment facilities are provided at 185 establishments, or 37 percent of the sources of industrial waste pollution within the entire Susquehanna Basin. No waste treatment facilities are provided for 173 or 35 percent of the establishments and the situation at the remaining 138 establishments (28 percent) is undetermined.

The industrial sources of pollution are principally establishments related to food and kindred products, mining industries, fabricated metals, textiles, paper, chemical, and leather products. About 89 percent of the sources and treatment works are distributed throughout the North Branch and Main Stem Sub-Basins, with eight percent in the West Branch Sub-Basin and three percent in the Juniata Sub-Basin.

Adequacy of Existing Treatment Facilities

Approximately 47 percent or 42 of the existing municipal sewage treatment plants are of adequate design and 46 plants are operated in a satisfactory manner; 17 plants are unsatisfactory as to design with eight plants unsatisfactory in operation; the design of 31 plants and operation of 36 plants is undetermined.

Industrial waste treatment facilities are of satisfactory design in 150 establishments, unsatisfactory in seven establishments and undetermined in the remaining 28. Operation is satisfactory for 110 of the industrial treatment facilities, ten are unsatisfactory and 65 are undetermined.

Progress in Pollution Abatement

Fifteen sewage treatment plants were constructed throughout the basin within the years 1946 to 1949 inclusive; six in the North Branch Sub-Basin, six in the West Branch Sub-Basin and three in the Susquehanna Main Stem Sub-Basin. From January to June, 1950 one additional treatment works was constructed in the Susquehanna Main Stem Sub-Basin. The trends in sewage works construction since 1910 are shown in the graph "Growth in Sewage Treatment."

Fifty-three industrial waste treatment works were constructed during the period 1946-1949 inclusive and 20 additional during January - June, 1950. Many of the coal breakers in the Susquehanna River Basin now have desilting facilities, and it is expected that the others will have treatment works in operation before January, 1952.

Pollution Prevention Measures Required

New or improved sewage treatment plants are required for 141 municipalities to serve a population of approximately 1,226,000 and 101 industrial establishments need improved or new industrial waste treatment facilities. Project requirements are undetermined for 102 municipal sources of pollution with a population of nearly 367,000 and for 230 industrial establishments discharging wastes to the streams, including 110 in New York State for which no detailed survey data are available.

It is estimated that the construction of required municipal sewage treatment plants in the Susquehanna River Basin will cost approximately $95,670,000.

In the Pennsylvania portion of the Susquehanna Basin, 91 municipalities have been ordered to construct and place in operation sewage treatment works by May - June 1952. These orders apply to practically all municipalities in the Juniata Sub-Basin with the exception of a few smaller communities; all municipalities along the North Branch, up to the New York State Line, excluding the Lackawanna which is acid, municipalities along the West Branch up to and including Lock Haven; and municipalities along the main stem from Northumberland to the Maryland-Pennsylvania Line.

Table A. Sources of pollution*, municipal, Susquehanna River Basin

Municipalities**	Sources of pollution (in number of municipalities)	Population served by sewerage system	Amount of pollution discharged to watercourse (in terms of equivalent number of people)***
Having data on pollution load discharged to watercourse	217	1,331,515	1,228,150
Having population data available (Data on pollution load to watercourse incomplete or not available)	68	339,000	Not applicable
Total	285	1,670,515	--

*The data appearing in this and the subsequent tables for this sub-basin are summations of readily available information. In some cases the data are incomplete. Further, arrangement of data in these tables is difficult because many municipalities have multiple outlets, many of the existing treatment facilities serve several municipalities, and in some cases several treatment plants serve a single municipality. Accordingly, in comparing the tables minor irregularities may become apparent.

In subsequent reports, these inconsistencies will disappear as field investigations are made and the more complete information is obtained.

**Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

***Includes industrial wastes discharged into municipal sewerage systems.

Table B. Sources of pollution, industrial*, Susquehanna River Basin

Industries	Sources of pollution (in number of plants)	Amount of pollution discharged to watercourse (in terms of equivalent number of people)
Producing organic wastes	234[a]	111,196
Producing organic wastes	190[b]	Undetermined
Producing inorganic wastes	216	Not applicable
Producing wastes of undetermined type	9	Undetermined
Total	496[c]	--

*Industries having separate outlets discharging wastes directly to water course.

[a] Includes 69 plants also producing inorganic wastes.

[b] Includes 84 plants also producing inorganic wastes.

[c] Total adjusted to correct for duplication noted in footnotes a and b.

Table C. Existing treatment facilities, municipal, Susquehanna River Basin

Degree of treatment provided	Number		Population served
	Municipalities*	Plants	
Primary	38	38	231,840
Secondary	51	52	271,920
No treatment	196	--	1,166,755
Total	285	90	1,670,515

*Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

Note: In the New York State portion of the basin there are also approximately 9,000 persons in 27 villages or hamlets without central sewer systems but served by private or individual sewers, not included in the above table.

Table D. Existing treatment facilities, industrial*, Susquehanna River Basin

Type industry	Number of plants	Number of industrial plants having:		
		Treatment facilities	*No treatment facilities*	*Undetermined facilities*
Food and kindred products..	208	39	87	82
Textile mill products......	21	8	7	6
Lumber and wood products...	1	0	1	0
Paper and allied products..	18	5	11	2
Chemical and allied products.....................	12	5	3	4
Petroleum and coal products	4	1	--	3
Rubber products............	--	--	--	--
Leather and leather products.....................	13	8	4	1
Primary metal products.....	4	1	--	3
Fabricated metal products..	22	2	12	8
Miscellaneous..............	111	55	39	17
Mining.....................	82	61	9	12
Total....................	496	185	173	138

*Industries having separate outlets and discharging wastes directly to watercourse.

Table E. Adequacy of existing treatment facilities, Susquehanna River Basin

Existing treatment facilities	Number	Adequacy with relation to:					
		Capacity			Operation		
		Satisfactory	Unsatisfactory	Undetermined	Satisfactory	Unsatisfactory	Undetermined
Municipal	90[a]	42[b]	17[c]	31[d]	46[e]	8[f]	36[g]
Industrial	185	150	7	28	10	10	65

[a] Serve a population of 503,760.

[b] Serve a population of 207,525.

[c] Serve a population of 107,700.

[d] Serve a population of 188,535.

[e] Serve a population of 279,825.

[f] Serve a population of 33,600.

[g] Serve a population of 190,335.

Table F. Progress in pollution abatement, Susquehanna River Basin

Year	Municipal		Industrial	
	Plants completed	Design population	Plants completed	Amount of waste treated (in terms of equivalent number of people)
1946	2	2,000[a]	1	165
1947	3	2,300[b]	14	--
1948	3	600[a]	16	642[c]
1949	7	7,000[a]	22	32,000[d]

[a] Design population for one plant.

[b] Design population for two plants.

[c] Population equivalent for twelve plants.

[d] Population equivalent for four plants.

Note: From January to June, 1950 one additional sewage treatment plant and 20 industrial waste treatment plants completed in Pennsylvania portion of basin.

Table G. Requirements for municipal and industrial waste treatment plants*, Susquehanna River Basin

Requirements	Municipal		Industrial
	Number	*Population* served by facilities	Number
New plant	122	981,055	98
Enlargement or additions to existing plant	17	242,650	3
Replace existing plant	2	2,150	--
No project required	42	77,690	165
Undetermined	102	366,970	230[a]
Total	285	1,670,515	496

*The needs set forth in this table are based on presently available information. However, future studies and evaluation may result in some changes in these needs.

[a] New York State requirements undetermined for 110 industrial establishments for which no detail survey data are available.

Table H. Status of treatment works project to abate pollution, July 1, 1950, Susquehanna River Basin

Status of project	Number	
	Municipal	Industrial
No formal action	77	180[a]
Abatement ordered	124	101
Plans under preparation	30	8
Final plans approved	75	22
Construction awaiting financing	--	--
Under construction	2	9
Status undetermined	33	49

[a] Includes 110 industrial establishments in New York State for which no detail survey data are available.

Note: Recently Pennsylvania ordered 91 of the municipalities within the basin to construct and place in operation sewage treatment plants by May-June, 1952.

Table I. List of Needed Projects, Sub-Basins of the Susquehanna River Basin

Municipalities and industries needing new or improved treatment facilities are tabulated on the following pages. "Municipalities" in the tabulations includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

The list is based upon information readily available pending completion of additional field surveys and investigations by the respective State water pollution control boards. It is admittedly incomplete but is believed to contain most of the significant sources of pollution. Consequently, the requirement "new plant" may upon future investigation indicate connection to city sewers, or other alternate requirements for industries and in some instances for small municipalities or areas contiguous to larger areas having treatment facilities.

Municipalities and industries desiring detailed information on problems affecting them are referred to their State water pollution control agency.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, North Branch--Susquehanna River Sub-Basin

Name	Population served	Project requirements	Remarks
New York--Municipal:			
Bainbridge	350	Replace existing plant.	--
Bath (Town) (Veterans Administration Facility)	1,800	Replace existing plant.	--
Binghamton	83,000	New plant.	Final plans approved. Estimated cost: $2,069,000.
Broome Co. Home	300	New plant.	--
Elmira	50,000	Enlargement or addition to existing plant.	Preliminary plans approved. Estimated cost: $2,069,000.
Endicott	22,000	New plant.	--
Greene	2,000	New plant.	--
Hamilton	3,000	Enlargement or addition to existing plant.	Final plans approved. Estimated cost: $89,000.
Hornell	15,000	Enlargement or addition to existing plant.	Plans under preparation. Estimated cost: $225,000.
Johnson City	22,000	New plant.	--
New Berlin	600	New plant.	--
Norwich	8,500	New plant.	Final plans approved. Estimated cost: $141,600.
Oneonta	12,000	Enlargement or addition to existing plant.	Preliminary plans approved. Estimated cost: $170,000.
Owego	5,000	New plant.	Final plans approved. Estimated cost: $207,000.
Oxford	300	New plant.	--
Painted Post	2,500	Enlargement or addition to existing plant.	--
Sherburne	--	New plant.	Plans completed. Estimated cost - sewers and treatment plant $116,840.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, North Branch--Susquehanna River Sub-Basin--Continued

Name	Population served	Project requirements	Remarks
Waterville	--	New plant.	Plans completed. Estimated cost - sewers and treatment plant $234,520.
Waverly	1,000	New plant.	Final plans approved. Estimated cost: $800,000.
Pennsylvania:			
Athens	2,500	New plant.	Abatement ordered. Plans completed.
Avoca	4,000	New plant.	Abatement ordered. Final plans approved.
Berwick	7,000	New plant.	Abatement ordered. Final plans approved.
Bloomsburg	9,800	New plant.	Abatement ordered. Final plans approved.
Canton	1,500	New plant.	Abatement ordered. Final plans approved.
Catawissa	2,050	New plant.	Abatement ordered. Final plans approved.
Dallas	1,500	Abatement or new plant.	Abatement ordered.
Danville	7,000	New plant.	Abatement ordered. Final plans approved.
Dunmore	18,000	Abatement or new plant.	Abatement ordered.
Dupont	5,300	Enlargement existing plant.	Abatement ordered. Plans completed.
Duryea	3,500	New plant.	Abatement ordered. Final plans approved.
Edwardsville	8,000	Abatement or new plant.	Abatement ordered.
Exeter	4,000	New plant.	Abatement ordered. Plans completed.
Factoryville	900	Abatement or new plant.	Abatement ordered.
Forty-Fort	6,000	Abatement or new plant.	Abatement ordered.
Halstead	1,300	Abatement or new plant.	Abatement ordered.
Hughestown	2,340	New plant.	Abatement ordered. Plans under preparation.
Kingston	20,600	New plant.	Abatement ordered. Final plans approved.
Kingston Township Luzerne Co	4,000	Abatement or new plant.	Abatement ordered.
Laceyville	500	New plant.	Abatement ordered. Plans under preparation.
Mansfield	1,900	New plant.	Abatement ordered. Final plans approved.
Millville	350	New plant.	Abatement ordered. Final plans approved.
Nanticoke	24,350	New plant.	Abatement ordered. Plans completed.
Nescopeck	1,700	New plant.	Abatement ordered. Final plans approved.
Nicholson	1,000	Abatement or new plant.	Abatement ordered.
Oakland	700	New plant.	Abatement ordered. Plans under preparation.
Pittston	17,800	New plant.	Abatement ordered. Plans completed.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, North Branch--Susquehanna River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Plains Township Luzerne Co.	7,500	New plant.	Abatement ordered. Plans completed.
Plymouth	12,500	New plant.	Abatement ordered. Final plans approved.
Sayre	3,500	New plant.	Abatement ordered. Final plans approved.
Shickshinny	2,400	Abatement or new plant.	Abatement ordered.
Susquehanna	--	Abatement or new plant.	Abatement ordered.
Swoyerville	6,220	Abatement or new plant.	Abatement ordered.
Thompson	300	New plant.	Abatement ordered. Plans under preparation.
Towanda	4,100	Enlargement to existing plant.	Abatement ordered. Final plans approved.
Troy	1,200	Enlargement to existing plant.	Abatement ordered. Plans under preparation.
Tunkhannock	600	Enlargement to existing plant.	Abatement ordered. Plans under preparation.
Warrior Run	50	Abatement or new plant.	Abatement ordered.
Westfield	1,300	New plant.	Abatement ordered. Final plans approved.
West Pittston	7,800	New plant.	Abatement ordered. Final plans approved.
Wilkesbarre	89,000	New plant.	Abatement ordered. Final plans approved.
Wyalusing	400	New plant.	Abatement ordered. Final plans approved.
Wyoming	4,700	New plant.	Abatement ordered. Plans completed.
Retreat State Hospital	1,200	New plant.	Abatement ordered. Plans under preparation.
Pittston Hospital	--	New plant.	Abatement ordered. Plans under preparation.
Keystone Junior College	--	Abatement or new plant.	Abatement ordered.
Glen Summit Association	--	New plant.	Abatement ordered. Plans under preparation.
New York--Industrial:			
Data not available to determine project requirements for 110 industrial establishments.			
Pennsylvania:			
Armour Leather Co., Noxen Township, Wyoming County	--	Enlargement or addition to existing plant.	Abatement ordered. Plans under preparation.
Borden Farm Products, Susquehanna County	--	New plant.	Abatement ordered.
Center Milk Product Co., Middlebury Center	--	New plant.	Abatement ordered.
Clemo Milk Product Co., Clifford Township Susquehanna County	--	New plant.	Abatement ordered.

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, North Branch--Susquehanna River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Dairymen's League Co-op. Association, New Milford	--	Enlargement or addition to existing plant.	Abatement ordered.
Dairymen's League Co-op. Association, Nicholson	--	New plant.	Abatement ordered.
Dairymen's League Co-op. Association, Herrick Township, Susquehanna County	--	New plant.	Abatement ordered. Under construction.
Dallas Dairy, Dallas	--	New plant.	Abatement ordered.
East Smithfield Farms, Inc., E. Smithfield	--	New plant.	Abatement ordered.
Glen Alden Coal Co., Hanover Township, Luzerne County	--	New plant.	Abatement ordered. Final plans approved. Under construction.
Glen Dale Sand & Stone Co., Moosic	--	New plant.	Abatement ordered.
Glenn City Coal Co., Inc., Beaver Township, Columbia County	--	New plant.	Abatement ordered. Under construction or completed.
Harbinson Dairies, Millville	--	New plant.	Abatement ordered.
Harrington Dairy Co., Benton	--	New plant.	Abatement ordered.
Hillcrest Farm Dairy, Scott Township, Lackawanna County	--	New plant.	Abatement ordered.
Hudson Coal Co., Marvin Breaker, Laflin	--	New plant.	Abatement ordered. Final plans approved.
Jeddo Highland Coal Co., Hazel Township, Luzerne County	--	New plant.	Abatement ordered. Final plans approved.
Jermyn Green Coal Co., Port Blanchard	--	New plant.	Abatement ordered. Final plans approved.
Meshoppen Creamery Works, Meshoppen	--	New plant.	Abatement ordered.
Montdale Dairy Scott Township Lackawanna County	--	New plant.	Abatement ordered.
Nicholson Dairy Corp., Nicholson	--	New plant.	Abatement ordered.
O'Malia Laundry, Kingston Township, Luzerne County	--	New plant.	Abatement ordered.

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, North Branch--Susquehanna River Sub-Basin--Continued

Name	Population served *	Project requirements	Remarks
Penna. Hide Co., Inc., Pittston	--	New plant.	Abatement ordered.
Phila. Dairy Product Co., Inc., Fairdale	--	New plant.	Abatement ordered.
Pittston Paper Corp., Exeter Township, Luzerne County	--	New plant.	Abatement ordered.
Prices Dairy, Butler Township, Luzerne County	--	New plant.	Abatement ordered.
Puritan Dairy Co., Tunkhannock	--	New plant.	Abatement ordered.
Sheffield Farms Inc., Starruca	--	New plant.	Abatement ordered.
Sheffield Farms Inc., New Milford	--	New plant.	Abatement ordered.
Sheffield Farms Inc., Hop Bottom	--	New plant.	Abatement ordered.
E. J. Stanley Live Stock, Choconut Township, Susquehanna County	--	New plant.	Abatement ordered.
Supreme Anthracite Coal Mining Co., Blakeley	--	New plant.	Abatement ordered. Final plans approved.
F. L. Surace Coal Co., Childsboro	--	New plant.	Abatement ordered. Final plans approved. Under construction.
Swift & Co., Hallstead	--	New plant.	Abatement ordered. Plans under preparation.
Wyoming Sand & Gravel Co., Exeter Township, Wyoming Co	--	New plant.	Abatement ordered.
Wyoming Sand & Stone Co., Ransom Township, Lackawanna Co	--	New plant.	Abatement ordered.
No. 9 Coal Co., Hughestown	--	New plant.	Abatement ordered. Final plans approved.
West Branch--Susquehanna River Sub-Basin			
Pennsylvania--Municipal:			
Avis	1,100	New plant.	Abatement ordered. Final plans approved.
Clearfield	9,400	New plant.	Abatement ordered. Final plans approved.
Curwensville	2,500	New plant.	Abatement ordered. Final plans approved.
Delaware Township, Northumberland Co	1,600	Abatement or new plant.	Abatement ordered.
Eagles Mere	2,000	New plant.	Abatement ordered. Plans under preparation.
Galeton	1,600	New plant.	Abatement ordered. Plans under preparation.

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, West Branch—Susquehanna River Sub-Basin—Continued

Name	Population served *	Project requirements	Remarks
Hughesville	1,950	New plant.	Abatement ordered. Plans under preparation.
Jersey Shore	5,400	New plant.	Abatement ordered. Final plans approved.
Lewisburg	3,500	New plant.	Abatement ordered. Final plans approved.
Lock Haven	11,000	New plant.	Abatement ordered. Final plans approved.
Loyalsock Township, Lycoming Co	2,000	New plant.	Abatement ordered. Final plans approved.
Mifflinburg	1,400	New plant.	Abatement ordered. Final plans approved.
Mill Hall	1,000	New plant.	Abatement ordered. Final plans approved.
Milton	9,000	New plant.	Abatement ordered. Final plans approved.
Montgomery	1,800	New plant.	Abatement ordered.
Muncy	2,000	New plant.	Abatement ordered. Final plans approved.
New York Central, Avis	—	New plant.	Abatement ordered. Plans under preparation.
Port Matilda	600	Abatement or new plant.	Abatement ordered.
South Williamsport	6,050	Enlargement to existing plant.	Abatement ordered. Final plans approved.
Watsontown	2,000	Enlargement to existing plant.	Abatement ordered. Final plans approved.
Wellsboro	3,650	Enlargement to existing plant.	Abatement ordered.
Williamsport	42,500	New plant.	Abatement ordered. Final plans approved.
Pennsylvania—Industrial:			
Borden's Milk Co., Wellsboro	—	Abatement or new plant.	Abatement ordered.
Corning Glass Works, Wellsboro	—	Abatement or new plant.	Abatement ordered.
Abraham Fine, Loyalsock Township, Lycoming Co	—	Abatement or new plant.	Abatement ordered.
Harrington & Co., Dushore	—	Abatement or new plant.	Abatement ordered.
Howe's Leather Co., Curwensville	—	New plant.	Abatement ordered. Plans under preparation.
New York Central System, Pine Creek Township, Clinton Co	—	Abatement or new plant.	Abatement ordered.
Pennsylvania Power & Light Co. Williamsport	—	New plant.	Abatement ordered. Plans under preparation.
John Peters, Loyalsock Township, Lycoming Co	—	Abatement or new plant.	Abatement ordered.

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, West Branch--Susquehanna River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Sunnybrook Farms Milk Co., Galeton	—	Abatement or new plant.	Abatement ordered.
L. A. Wehler & Co., Porter Township, Lycoming Co.	—	Abatement or new plant.	Abatement ordered.
Juniata River Sub-Basin			
Pennsylvania—Municipal:			
Alexandria	200	Abatement or new plant.	Abatement ordered.
Altoona	78,000	New plant.	Abatement ordered. Final plans approved.
Bedford	3,300	New plant.	Abatement ordered. Final plans approved.
Bellwood	2,700	Enlargement or addition to existing plant.	Abatement ordered. Final plans approved.
Burnham	2,000	New plant.	Abatement ordered. Plans under preparation.
Everett	2,400	New plant.	Abatement ordered. Final plans approved.
Holidaysburg	6,100	Abatement or new plant.	Abatement ordered.
Huntingdon	7,250	New plant.	Abatement ordered. Final plans approved.
Kistler	500	Abatement or new plant.	Abatement ordered.
Lewistown	14,000	New plant.	Abatement ordered. Final plans approved.
Logan Township, Blair Co.	425	New plant.	Abatement ordered. Final plans approved.
Mapleton	400	Abatement or new plant.	Abatement ordered.
Mifflintown	1,000	New plant.	Abatement ordered. Final plans approved.
Millerstown	700	Abatement or new plant.	Abatement ordered.
Mount Union	4,000	New plant.	Abatement ordered. Final plans approved.
Newport	2,000	New plant.	Abatement ordered. Final plans approved.
Orbisonia	500	New plant.	Abatement ordered. Final plans approved.
Port Royal	500	Abatement or new plant.	Abatement ordered.
Pennsylvania Glass Sand Corp., Wayne Township, Mifflin Co.	—	New plant.	Abatement ordered. Final plans approved.
Pennsylvania Huntingdon Industrial School	950	Abatement or new plant.	Abatement ordered.
Saxton	1,150	Abatement or new plant.	Abatement ordered.
Smithfield Township, Huntingdon Co.	2,700	Enlargement or addition to existing plant.	Abatement ordered. Plans under preparation.

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Juniata River Sub-Basin--Continued

Name	Population served *	Project requirements	Remarks
Pennsylvania--Industrial:			
American Viscose Corp., Granville Township, Mifflin Co.	—	New plant or enlargement.	Abatement ordered. Final plans approved. Under construction.
New Enterprise Stone & Lime Corp., Tyrone Township, Blair Co.	—	Abatement or new plant.	Abatement ordered.
New Enterprise Stone & Lime Co., Walker Township, Huntingdon Co.	—	New plant.	Abatement ordered. Final plans approved. Under construction.
Penn. Glass & Sand. Corp., Brady Township, Huntingdon Co.	—	New plant.	Abatement ordered. Final plans approved.
Pittsburg Silica Sand Co., W. Providence Township, Bedford Co.	—	New plant.	Abatement ordered. Final plans approved.
Main Stem--Susquehanna River Sub-Basin			
Maryland--Municipal:			
Conowingo	200	Enlargement or addition to existing plant.	—
Pennsylvania:			
Christiana	1,000	New plant.	Abatement ordered. Plans under preparation.
Columbia	11,550	New plant.	Abatement ordered. Final plans approved.
Conestoga Township, Lancaster Co.	—	New plant.	Abatement ordered. Final plans approved.
Dauphin	8,240	New plant.	Abatement ordered.
Duncannon	1,710	New plant.	Abatement ordered. Final plans approved.
Glen Rock	1,400	New plant.	Abatement ordered. Final plans approved.
Hanover Township	5,000	Enlargement to existing plant.	Abatement ordered. Plans under preparation.
Harrisburg	84,000	New plant.	Abatement ordered. Final plans approved.
Highspire	2,000	New plant (Sewage collection system).	Abatement ordered. Final plans approved.
Lancaster, North and South,	72,000	Enlargement or addition to existing plants.	Abatement ordered. Plans under preparation.
Lemoyne	3,000	New plant.	Abatement ordered. Final plans approved. Under construction.
Lykens	2,500	New plant.	Abatement ordered. Final plans approved.

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Main Stem--Susquehanna River Sub-Basin--Continued

Name	Population served *	Project requirements	Remarks
Mahanoy City	13,000	Abatement or new plant.	Abatement ordered.
Martic Township, Lancaster	--	New plant.	Abatement ordered. Final plans approved.
Marysville	1,000	New plant.	Abatement ordered. Final plans approved.
Mechanicsburg	6,000	New plant.	Abatement ordered. Final plans approved. Under construction.
Middleburg	400	New plant.	Abatement ordered. Final plans approved.
Middletown	5,500	Abatement or new plant.	Abatement ordered.
Millersburg	2,960	New plant.	Abatement ordered. Final plans approved.
Mt. Wolf	400	New plant.	Abatement ordered. Final plans approved.
New Cumberland	3,000	New plant.	Abatement ordered. Final plans approved.
New Freedom	300	Abatement or new plant.	Abatement ordered.
New Oxford	900	Enlargement or addition to existing plant.	Abatement ordered.
Northumberland	4,450	New plant.	Abatement ordered. Final plans approved.
North York Borough	2,400	--	Abatement ordered. Final plans approved. Will enter York sewerage system.
Shippensburg	5,200	New plant.	Abatement ordered. Final plans approved.
Springettsbury Township, York Co.	3,800	New plant.	Abatement ordered. Final plans approved.
Spring Grove	1,260	New plant.	Abatement ordered. Final plans approved.
Steelton	13,000	New plant.	Abatement ordered. Final plans approved.
Sunbury	15,000	New plant.	Abatement ordered. Final plans approved.
Williamstown	1,500	New plant.	Abatement ordered. Final plans approved.
Wormleysburg	1,500	New plant.	Abatement ordered. Final plans approved.
York	60,000	Enlargement or addition to existing plant.	Abatement ordered. Final plans approved.
Pennsylvania--Industrial:			
American Chain & Cable Co., York	--	New plant.	Abatement ordered.
Barnes Wall Paper Co., West York	--	Abatement or new plant.	Abatement ordered.
Bethlehem Steel Corp., Lebanon	--	Abatement or new plant.	Abatement ordered.

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Main Stem--Susquehanna River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Bethlehem Steel Corp., Nut & Bolt Plant,.. Lebanon	—	New plant.	Abatement ordered. Final plans approved. Under construction.
Blackwood Coal Co., Inc., Reilly Township, Schuylkill Co	—	Abatement or new plant.	Abatement ordered. Plans under preparation.
Bressler Coal Washery, Pine Grove Township, Schuylkill Co	—	Abatement or new plant.	Abatement ordered.
Cloister Dairies, Ephrata	—	Abatement or new plant.	Abatement ordered.
Columbia Malleable Casting, Columbia	—	New plant.	Abatement ordered.
Dean Mills Inc., Manheim Township, Lancaster Co	—	Abatement or new plant.	Abatement ordered.
Hugh F. Dolan, Tremont	—	Abatement or new plant.	Abatement ordered.
East Bear Ridge Colliery, W. Mahanoy Township, Schuylkill Co	—	Abatement or new plant.	Abatement ordered.
Echo Mfg. Co., Tremont	—	Abatement or new plant.	Abatement ordered. Plans under preparation.
C. H. Eckert Swatara Township, Lebanon Co	—	Abatement or new plant.	Abatement ordered.
John J. Ernest Coal Co., Knox Township, Clearfield Co	—	Abatement or new plant.	Abatement ordered.
Hanover Wire Cloth Co., Hanover	—	Abatement or new plant.	Abatement ordered.
Hungerford Packing Co., Shrewsbury Township, York Co	—	Abatement or new plant.	Abatement ordered.
Indiana Head Coal Co., Frailey Township, Schuylkill Co	—	Enlargement or addition to existing plant.	Abatement ordered. Final plans approved.
Jonathan Coal Mining Co., Union Township, Lebanon Co	—	Abatement or new plant.	Abatement ordered. Plans under preparation.
Jonathan Coal Mining Co., Little Mahanoy Township, Northumberland Co	—	Abatement or new plant.	Abatement ordered.
Keystone Wire Cloth Co., Hanover	—	Abatement or new plant.	Abatement ordered.
Koller Fertilizer Co., Glen Rock	—	New plant.	Abatement ordered.
Lancaster Swiss Cheese Co., Leacock	—	Abatement or new plant.	Abatement ordered.

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Main Stem--Susquehanna River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Littles Dairy, Pennsylvania Township, York Co.	--	Abatement or new plant.	Abatement ordered.
Lykoal Inc., Rush Township, Dauphin Co.	--	Abatement or new plant.	Abatement ordered.
Mahanoy City Gas Co., Mahanoy City	--	Abatement or new plant.	Abatement ordered.
Fred D. Maurer, Tremont	--	Abatement or new plant.	Abatement ordered.
McKay Chain Co., Spring Garden Township, York Co.	--	New plant.	Abatement ordered. Final plans approved.
Molly Pitcher Canning Co., Dickinson Township, Cumberland Co.	--	Abatement or new plant.	Abatement ordered.
Morea, New Boston Breaker Corp., Mahanoy Township, Schuylkill Co.	--	Abatement or new plant.	Abatement ordered.
Morgan Mill Inc., Lititz	--	New plant.	Abatement ordered. Final plans approved.
Myers Canning Co., Spring Grove	--	Abatement or new plant.	Abatement ordered.
National Gypsum Co., W. Manchester Township, York Co.	--	Abatement or new plant.	Abatement ordered.
Necho Coal Co., Frailey Township, Schuylkill Co.	--	New plant.	Abatement ordered. Final plans approved.
New York Wire Cloth Co., Spring Garden Township, York Co.	--	Abatement or new plant.	Abatement ordered.
New York Wire Cloth Co., York	--	Abatement or new plant.	Abatement ordered.
Oak Coal Yard, Ralpho Township, Northumberland Co.	--	Abatement or new plant.	Abatement ordered.
Oak Ridge Coal Co., Tremont Township, Schuylkill Co.	--	Abatement or new plant.	Abatement ordered.
Oak Ridge Coal Co., Reade Township, Cambria Co.	--	Abatement or new plant.	Abatement ordered.
Oakwood Coal Co., Pine Grove	--	New plant.	Abatement ordered. Final plans approved.
Otto Coal Co., Hegins Township, Schuylkill Co.	--	Abatement or new plant.	Abatement ordered.
Penn Packing Co., Royalton	--	Abatement or new plant.	Abatement ordered.

*Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Main Stem--Susquehanna River Sub-Basin--Continued

Name	Population Served*	Project requirements	Remarks
Pennsylvania RR Yards, Enola	—	New plant.	Abatement ordered. Final plans approved. Under construction.
Schmidt & Ault Paper Co., York	—	New plant.	Abatement ordered. Final plans approved. Under construction.
Spece's Dairy, Middle Paxton Township, Dauphin Co.	—	Abatement or new plant.	Abatement ordered.
Charles G. Summers, New Freedom	—	New plant.	Abatement ordered.
Swift Coal Co., Coal Township, Northumberland Co.	—	Abatement or new plant.	Abatement ordered.
Textile Print & Finishing Co., Lebanon	—	Abatement or new plant.	Abatement ordered. Plans under preparation.
Turner Westcott Co., W. Nottingham Township, Chester Co.	—	New plant.	Abatement ordered. Final plans approved.
Ralph E. Zerbe Coal Co., Washington Township, Schuylkill Co.	—	Abatement or new plant.	Abatement ordered.

*Strength of industrial waste measured in terms of equivalent number of people.

CHESAPEAKE BAY BASIN

Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin

General Description

The drainage basin of the Upper Chesapeake lies almost entirely in Maryland, with very small portions in Delaware and Pennsylvania. It consists of the Chesapeake Bay, north of the Maryland-Virginia boundary, and some dozen or more streams (except the Potomac and Susquehanna) of varying sizes which drain into the Bay. The land area of the sub-basin is approximately 6,800 square miles and the water area approximately 2,100 square miles.

The principal streams of this sub-basin listed clockwise around the Bay, are the Patuxent River, Patapsco River, Elk River, Sassafras River, Chester River, Choptank River, Nanticoke River, Wicomico River, and the Pocomoke River.

The sub-basin lies within both the Piedmont Plateau and the Coastal Plain, with the streams of the western drainage of the sub-basin crossing the fall line on their way to the Chesapeake Bay. These streams, after crossing the fall line, have sluggish currents and drainage is imperfect. There are numerous tidal estuaries and bays deep enough to admit ocean-going vessels. The streams of the Eastern Shore are tidal for the major portion of their length, with the land as flat as a table at the southern end and never more than fifteen feet above sea level. The Bay itself is the drowned valley of the Susquehanna River.

Shales and sandstones predominate in the Piedmont Plateau with granite outcroppings. Sand and gravel deposits are another geologic feature. The sandy friable soils are very suitable for the growth of vegetables and melons, with some tobacco being farmed on the western shore.

The climate on a year-round basis is excellent. The winters are mild but invigorating. The seasonal changes are well marked and the summers warm but tempered by cool spells that originate in more northern latitudes. The annual precipitation averages around 42 inches. Snowfall is moderate and does not remain long on the ground. The growing season averages 186 days. Severe storms are infrequent and prolonged droughts unusual.

Economic Development

Within the economic area of this region, as defined by 15 counties in Maryland and one county in Delaware, live some 1,683,000 people. Of this total population, about 40 percent reside in Baltimore City. No other comparable area has more than nine percent of the total population. Although agriculture was the foundation of the early history of this region and the Bay area now supports a very rich fishery in terms of productivity (greater per unit area than any of the Atlantic fishing banks), the economy is dominated by the manufacturing and industrial complex of the Baltimore area. In recent years there has been some decentralization of manufacturing to the smaller cities of the Eastern Shore, particularly in clothing production. There is also a considerable canning and food processing industry based on the seasonal production of vegetables. Poultry packing is very important to the economy of this region.

Income producing activity is led by manufacturing with nearly 55 percent of the total, followed by retail trade, wholesale trade, farming, selected service trades, hotels and tourist courts, and fisheries in order of income produced. The largest labor forces are found in manufacturing and farming.

Although farming is not the leading income producing activity, it is the dominant land use activity, with all but two counties and Baltimore City having more than 50 percent of the acreage in farms. In all but three counties and Baltimore City, the farm population is more than 20 percent and as high as 50 percent of the total.

Uses of Water Resources

The water resources of the Upper Chesapeake Sub-Basin have been developed principally about the uses of the waters of Chesapeake Bay. In addition to the considerable fin and shellfish production the Bay, with its central location on the Atlantic Coast and its excellent navigational features as a protected waterway, has caused its extensive development for both coast-wise and transocean shipping. With its location in respect to the great urban centers of Washington and Baltimore, the waters of the Bay are a tremendous recreational asset.

Although the major number of water supplies are derived from subsurface sources, there are two major surface water developments for potable water. One is the water supply of the City of Baltimore on Gunpowder and Patapsco Rivers, and the other that of the Washington Suburban Sanitary District.

The peripheral distribution of many streams about the centrally located Bay affords an unusual capacity of the drainage of the area to carry polluting materials. The many food processing plants of the region would place an unbearable pollution load on the streams if they were all located along one or two major rivers. Their scattered distribution along the many small waterways has resulted in localized pollution problems.

Pollution Contributed to Water Resources

The streams of the Upper Chesapeake Sub-Basin received pollution from 71 municipal sewer systems serving a population of about 1,034,000. However, 29 of these municipalities have treatment plants satisfactory in capacity, serving a population of approximately 922,000.

Industrial wastes discharged to the streams come from 225 sources. Of these 12 have a pollution discharge equivalent to 140,000 people; 150 produce organic wastes but have not been quantitatively assayed; 35 produce inorganic wastes; and 28 produce wastes of undetermined type. Fifty-four industries have treatment plants of satisfactory capacity.

Pollution Prevention Measures in Effect

Of the 71 sources of municipal pollution, 26 have primary treatment, 17 secondary, and 28 no treatment. These serve populations of 100,000; 882,000; and 52,000 respectively.

The production of food and kindred products is the activity of 159 plants, over 70 percent of the industries in the sub-basin. Of these, 99 have some sort of treatment facilities; nine have no treatment; and 51 have undetermined facilities. Of the remaining 66 plants, 22 produce chemicals or chemical products. Four of the 66 have treatment facilities, four have no treatment facilities, and the treatment facilities of 58 are undetermined. (Table D).

Adequacy of Existing Treatment Facilities

Forty-three municipalities have 45 treatment facilities of which 29 are satisfactory in capacity, six unsatisfactory, and ten undetermined. These serve populations of about 922,000; 5,000; and 55,000, respectively. In operation, 32 are satisfactory, four unsatisfactory, and nine undetermined, serving populations of approximately 929,000; 1,300; and 52,000, respectively. These are 103 industrial plants with treatment processes of which 54 are satisfactory in capacity, 31 unsatisfactory, and 18 undetermined. In opera-

Table A. Sources of pollution*, municipal, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin

Municipalities**	Sources of pollution (in number of municipalities)	Population served by sewerage system	Amount of pollution discharged to watercourse (in terms of equivalent number of people)***
Having data on pollution load discharged to watercourse	20	12,820	9,550
Having population data available (Data on pollution load to watercourse incomplete or not available)	51****	1,021,523	Not applicable
Total	71	1,034,343	--

*The data appearing in this and the subsequent tables for this sub-basin are summations of readily available information. In some cases the data are incomplete. Further, arrangement of data in these tables is difficult because many municipalities have multiple outlets, many of the existing treatment facilities serve several municipalities, and in some cases several treatment plants serve a single municipality. Accordingly, in comparing the tables minor irregularities may become apparent.

In subsequent reports, these inconsistencies will disappear as field investigations are made and the more complete information is obtained.

**Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers, other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

***Includes industrial wastes discharged into municipal sewerage systems.

****Population not available for four sources.

tion 69 are satisfactory, 21 unsatisfactory, and 13 undetermined.

Progress in Pollution Abatement

In the period of 1946 to 1949, no new municipal treatment plants were completed in this area. However, prior to that period 44 plants with a design capacity of over 1,010,000 were completed as shown in the figure "growth in Sewage Treatment". Similar information concerning industrial treatment plants was unavailable.

Pollution Prevention Measures Required

Waste treatment plant requirements indicate that 25 municipalities with a population of about 40,000 need new plants; five need enlargements or additions with a population served of 864,000; 31 with a population of 66,000 need no project; and ten are undetermined, with a population served of 64,000. The industrial requirements indicate 54 new plants, 43 enlargements or additions, 47 no project, and 81 are undetermined.

As of July 1, 1950, the status of treatment works projects to abate pollution was as follows: In municipal projects one plant was under construction; three had plans under preparation; and no action had been taken in 17 cases. Industrial projects found four under construction; one with final plans approved; nine with plans under preparation; and nine were under order to abate pollution. No formal action had been taken by 64, and the status of 14 were undetermined.

Table B. Sources of pollution, industrial*, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin

Industries	Sources of pollution (in number of plants)	Amount of pollution discharged to watercourse (in terms of equivalent number of people)
Producing organic wastes	12	140,100
Producing organic wastes	150	Undetermined
Producing inorganic wastes	35	Not applicable
Producing wastes of undetermined type	28	Undetermined
Total	225	--

*Industries having separate outlets and discharging wastes directly to watercourse.

Table C. Existing treatment facilities, municipal, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin

Degree of treatment provided	Number		Population served
	Municipalities*	Plants	
Primary	26	28**	100,099
Secondary	17***	17	881,916
No treatment	28	--	52,328
Total	71	45	1,034,343

*Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

**Includes 3 screening plants.

***No population data for four municipalities.

Table D. Existing treatment facilities, industrial*, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin

Type industry	Number of plants	Number of industrial plants having:		
		Treatment facilities	No treatment facilities	Undetermined facilities
Food and kindred products................	159	99	9	51
Textile products..........	2	--	--	2
Lumber and wood products................	1	--	--	1
Paper and allied products................	2	1	1	0
Chemical and allied products................	22	1	--	21
Petroleum and coal products................	10	--	1	9
Leather and leather products................	1	0	1	0
Primary metal products................	4	--	--	4
Other mining.............	6	2	--	4
Miscellaneous............	18	--	1	17
Total..................	225	103	13	109

*Industries having separate outlets and discharging wastes directly to watercourse.

Table E. Adequacy of existing treatment facilities, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin

Existing treatment facilities	Number	Adequacy with relation to:					
		Capacity			Operation		
		Satisfactory	Unsatisfactory	Undetermined	Satisfactory	Unsatisfactory	Undetermined
Municipal	45[a]	29[b]	6[c]	10[d]	32[e]	4[f]	9[g]
Industrial	103	54	31	18	69	21	13

[a] Serve a population of 982,015.

[b] Serve a population of 922,307. No population data for four treatment facilities.

[c] Serve a population of 4,983. No population data for two treatment facilities.

[d] Serve a population of 54,725.

[e] Serve a population of 928,711.

[f] Serve a population of 1,275.

[g] Serve a population of 52,029.
(Note: This table does not necessarily reflect the project requirements shown in table G).

Table F. Progress in pollution abatement, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin

Year	Municipal		Industrial	
	Plants completed	Design population	Plants completed	Amount of waste treated (in terms of equivalent number of people)
1946	None	--	--	--
1947	None	--	--	--
1948	None	--	--	--
1949	None	--	--	--

Table G. Requirements for municipal and industrial waste treatment plants*, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin

Requirements	Municipal		Industrial
	Number	Population served by facilities	Number
New plant	25	39,731**	54
Enlargement or additions to existing plant	5	864,152***	43
Replace existing plant	0	0	0
No project required	31	66,376	47
Undetermined	10	64,084	81
Total	71	1,034,343	225

*The needs set forth in this table are based on presently available information. However, future studies and evaluations may result in some changes in these needs.

**Population data not available from all sources.

***Includes one large plant satisfactory for present use but enlarging for future needs.

Table H. Status of treatment works project to abate pollution, July 1, 1950, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin

Status of project	Number	
	Municipal	Industrial
No formal action	17	64
Abatement ordered	2	9
Plans under preparation	3	9
Final plans approved	3	1
Construction awaiting financing	0	0
Under construction	1	4
Status undetermined	6	14

Table I. List of Needed Projects, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin (Chesapeake Bay Basin)

Municipalities and industries needing new or improved treatment facilities are tabulated on the following pages. "Municipalities" in the tabulations includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

The list is based upon information readily available pending completion of additional field surveys and investigations by the respective State water pollution control boards. It is admittedly incomplete but is believed to contain most of the significant sources of pollution. Consequently, the requirement "new plant" may upon future investigation indicate connection to city sewers, or other alternate requirements for industries and in some instances for small municipalities or areas contiguous to larger areas having treatment facilities.

Municipalities and industries desiring detailed information on problems affecting them are referred to their State water pollution control agency.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin

Name	Population served	Project requirements	Remarks
Delaware -- Municipal:			
Bridgeville..................	725	New plant.	No action.
Dagsboro.....................	219	New plant.	No action.
Frankford....................	450	New plant.	No action.
Greenwood....................	575	New plant.	No action.
Laurel.......................	1,950	New plant.	No action.
Seaford......................	2,450	New plant.	No action.
Selbyville...................	874	New plant.	No action.
Maryland:			
Anne Arundel County Sanitary Commission.......	1,220*	Three new plants.	No action.
Baltimore Back River Plant.....................	860,000	Enlargement or addition to existing plant.	Abatement ordered. Under construction. Estimated cost $7,000,000.
Baltimore Patapsco Plant.....................	--	Enlargement or addition to existing plant.	Plans under consideration. Estimated cost $2,000,000.
Chestertown.................	2,800	Enlargement or addition to existing plant.	No action.
Crisfield...................	3,908	Enlargement or addition to existing plant.	Plans completed.
Denton......................	1,575	New plant.	Plans in preparation.
District Training School....................	--	New plant.	No action.
Dreams Landing..............	375	New plant.	Plans in preparation.
Elkton......................	1,525	New plant.	Treatment being considered by Mayor and Council.
Federalsburg................	1,540	New plant.	Plans completed.

*Data for one plant only.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin--Continued

Name	Population served**	Project requirements	Remarks
Goldsboro	195	New plant.	Planning notice from Water Pollution Control Commission for project review.
Greenwood School	300	Enlargement or addition to existing plant.	No action.
Havre de Grace	3,600	New plant.	Planning notice.
North Beach	3,000	New plant.	Plans approved.
Ocean City	1,052	Enlargement or addition to existing plant.	No action.
Pocomoke City	2,100	New plant.	Planning notice.
Port Deposit	750	New plant.	No action.
Preston	280	New plant.	Planning notice.
Princess Anne	700	New plant.	Planning notice.
Salisbury	9,820	New plant.	Construction awaiting financing.
Sharptown	300	New plant.	Planning notice.
Snow Hill	1,600	New plant.	Planning notice.
Delaware -- Industrial:			
H. P. Cannon Canning Co., Bridgeville	64,000	Enlargement or addition to existing plant.	No action.
DuPont Nylon Plant, Seaford	700	New plant.	No action.
Eagle Poultry Co., Frankford	40,000	New plant.	No action.
Feather Plant, Greenwood	--	New plant.	No action.
Millsboro Poultry Co., Millsboro	18,000	Enlargement or addition to existing plant.	No action.
Noble Canning Co., Cannon	7,950	New plant.	No action.
Phillips Packing Co., Laurel	1,600	New plant.	No action.
Phillips Packing Co., Oak Grove	6,000	New plant.	No action.
H. and H. Poultry Co., Selbyville	25,000	New plant.	No action.
G. H. Steeley Canning Co., Vernon	--	New plant.	Ceased operation.
Vernon Packing Co., Vernon	22,900	New plant.	No action.
Ace Poultry Co., Berlin	--	Enlargement or additions to existing plant.	Plant not operating.
Alberton Cotton Mills, Inc., Alberton	--	New plant.	No action.
American Stores Co., Hurlock	--	New plant.	No action.
Bartgis Brothers, Co., Ilchester	--	New plant.	No action.
Bloch and Guggenheimer, Williamsburg	--	New plant.	No action.

**Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin--Continued

Name	Population served**	Project requirements	Remarks
Leon C. Bulow, Hynson....................	—	Enlargement or additions to existing plant.	Abatement ordered. Estimated cost $10,000.
C. and H. Packing Co., Hudsons Corner............	—	New plant.	Abatement ordered. Estimated cost $2,000.
Calvert Distilling Co., Relay.....................	—	New plant.	No action.
Campbell Soup Co., Salisbury.................	—	New plant.	No action.
Campbell Soup Co............	—	Enlargement or additions to existing plant.	No action.
Carney Sand and Gravel Co., Hydes.....................	—	New plant.	Abatement ordered.
Caroline Poultry Co., Denton.....................	—	New plant.	Plans in preparation.
Caroline Poultry Co., Federalsburg..............	—	Enlargement or additions to existing plant.	Abatement ordered. Estimated cost $5,000.
Chester Packing Co., Chestertown...............	—	Enlargement or additions to existing plant.	No action.
Choptank Packing Co., Choptank..................	—	Enlargement or additions to existing plant.	No action.
Cloverdale Farms Packing Co., Federalsburg.........	—	New plant.	No action.
Del-Mar-Va Poultry Co., Salisbury.................	—	New plant.	Plant not operating.
Denton Canning Co., Hobbs....................	750	Enlargement or additions to existing plant.	No action.
W. J. Dickey and Sons, Oella.....................	—	New plant.	No action.
Doughnut Corporation of America, Ellicott City.............	—	New plant.	No action.
John Dulaney and Sons, Fruitland.................	—	New plant.	Plans in preparation. Estimated cost $30,000.
Eastern Stainless Steel, Essex......................	—	New plant.	No action.
Easton Utilities Commission, Easton........	—	New plant.	Plans in preparation.
Elwood Canning Co., Preston...................	450	Enlargement or additions to existing plant.	No action.
Essential Oil Co., Woodbine..................	—	New plant.	No action.
Essig Packing Co., Taneytown.................	—	New plant.	No action.
Falls Packing Co., Reistertown...............	—	New plant.	No action.
Federal Paper Board Co., Whitehall.................	—	Enlargement or additions to existing plant.	No action.

**Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin--Continued

Name	Population served**	Project requirements	Remarks
Greensboro Canning Co., Greensboro	--	Enlargement or additions to existing plant.	No action.
Sherman T. Griffith Co., Harmony	--	Enlargement or additions to existing plant.	No action.
Hahn Brothers Co., Westminster	--	New plant.	Abatement ordered. Estimated cost $5,000.
Harbison Dairy, Inc., Hurlock	--	New plant.	Plans in preparation. Estimated cost $10,000.
Harper and Bateman Co., Hurlock	--	New plant.	No action.
Harrison and Jarboe, Chapel	--	Enlargement or additions to existing plant.	No action.
Harrison and Jarboe, Hobbs	--	New plant.	No action.
Harrison and Jarboe, Saint Michaels	--	Enlargement or additions to existing plant.	No action.
Hillsboro Queen Anne Co-op., Corporation, Woodbine	--	Enlargement or additions to existing plant.	Plant not in operation.
Hopewell Canning Co., Hopewell	--	New plant.	Abatement ordered. Estimated cost $2,000.
Hurlock Pickling Co., Hurlock	--	New plant.	No action.
Insley and Mitchell Co., Salisbury	--	Enlargement or additions to existing plant.	No action.
Charles Jarrell Corporation, Queen Anne	--	Enlargement or additions to existing plant.	No action.
Johnson Meat Products Co., Pocomoke City	--	Enlargement or additions to existing plant.	No action.
Killian Colbert Canning Co., Hoods Mills	--	New plant.	Plans in preparation. Estimated cost $1,500.
Earle Legates Co., Tanyard Siding	--	Enlargement or additions to existing plant.	No action.
Roy Legates Co., Bethlehem	--	New plant.	No action.
Logan-Ford Canning Co., Henderson	--	Enlargement or additions to existing plant.	Plans in preparation. Estimated cost $2,000.
Long Brothers Canning Co., Westover	--	Enlargement or additions to existing plant.	No action.

**Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin--Continued

Name	Population Served**	Project requirements	Remarks
Longwoods Canning Co., Longwoods	--	New plant.	Abatement ordered. Estimated cost $2,000.
George W. Magin, Taylorsville	--	New plant.	No action.
Mason Canning Co., Pocomoke City	--	Enlargement or additions to existing plant.	Cooperating with Water Pollution Control Commission.
Melville Woolen Co., Oakland Mills	--	New plant.	No action.
R. Messick and Sons, Bethlehem	--	New plant.	Plant not in operation.
Meyer Poultry Co., Ocean City	--	New plant.	Plant not in operation.
F. O. Mitchell Co., Kennedyville	--	Enlargement or additions to existing plant.	No action.
Monumental Distilling Co., Monumental	--	New plant.	No action.
Morgan Canning Co., Woodbine	--	New plant.	Cooperating with Water Pollution Control Commission.
J. L. Noell, Mount Airy	--	New plant.	No action.
Nuttle Canning Co., Hickman	--	New plant.	No action.
W. T. Onley Canning Co., Girdletree	--	Enlargement or additions to existing plant.	No action.
W. T. Onley Canning Co., Snowhill	--	Enlargement or additions to existing plant.	No action.
Park & Tilford Distillers, Owings Mills	--	Enlargement or additions to existing plant.	No action.
Penninsular Packing Co., Berlin	--	New plant.	Plant not in operation.
Perfection Laundry, Essex	--	New plant.	Plans in preparation.
Pet Milk Co., Greensboro	--	New plant.	Cooperating with Water Pollution Control Commission.
Phillips Packing Co., West Denton	--	Enlargement or additions to existing plant.	No action.
Phillips Packing Co., Williston	--	New plant.	No action.
Pocomoke Provision Co., Pocomoke City	--	Enlargement or additions to existing plant.	No action.
Pratt Phillips & Son, Inc., Salisbury	--	Enlargement or additions to existing plant.	Plant not in operation.

**Strength of industrial waste measured in terms of equivalent number of people.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Upper Chesapeake Bay and Maryland-Delaware Coast Sub-Basin--Continued

Name	Population served**	Project requirements	Remarks
Princess Anne Canning Co., Venton....................	--	Enlargement or additions to existing plant.	Abatement ordered. Estimated cost $100.00
Ridgely Canning Co., Ridgely....................	--	Enlargement or additions to existing plant.	No action.
H. W. Roberts Co., Clara......................	--	Enlargement or additions to existing plant.	Final plans approved. Estimated cost $3,000.
Ross and McIntyre Canning Co., Mount Vernon.........	--	Enlargement or additions to existing plant.	No action.
Saulsbury Brothers, Ridgely....................	--	Enlargement or additions to existing plant.	No action.
B. F. Schriver, Westminster...............	--	Enlargement or additions to existing plant.	Cooperating with Water Pollution Control Commission.
Snow Hill Poultry Co., Snow Hill.................	--	Enlargement or additions to existing plant.	Plans in preparation. Estimated cost $6,000.
Supplee Dairy Co., Princess Anne.............	--	New plant.	No action.
C. A. Swanson and Sons, Salisbury.................	--	New plant.	Plans in preparation. Estimated cost $3,000.
Swift and Co., Salisbury.................	--	Enlargement or additions to existing plant.	No action.
Tilghman Packing Co., Tilghman..................	--	Enlargement or additions to existing plant.	Plans in preparation. Estimated cost $2,500.
Trappe Canning Co., Trappe....................	--	Enlargement or additions to existing plant.	No action.
H. P. Tull and Co., Kingston..................	--	New plant.	Under construction. Estimated cost $600.
Vita Foods, Federalsburg..............	--	New plant.	No action.
Hobart Z. Wheatley Co., Federalsburg..............	--	Enlargement or additions to existing plant.	No action.
H. B. Wright & Son Co., Preston....................	--	New plant.	Plant not in operation.
Chas. T. Wrightson Son, Inc., Easton..............	--	Enlargement or additions to existing plant.	No action.
Yost Foods, Inc., Ridgely...................		Enlargement or additions to existing plant.	No action.

**Strength of industrial waste measured in terms of equivalent number of people.

Potomac River Sub-Basin

General Description

From its headwaters on the eastern slope of the Appalachian Mountains, the Potomac River flows in a general southeasterly direction some 400 miles to Chesapeake Bay. The upper river runs its course through the mountainous terrain of the Alleghenies, the rolling hills of the Piedmont Plateau, and reaches tidal elevation just below Great Falls near the District of Columbia. The main stem is formed by the junction of the North and South Branches below Cumberland, Md. The tidal section, navigable along its entire length, extends 117 miles from the District of Columbia to the Bay. The River drains an area of approximately 14,700 square miles in Maryland, Virginia, West Virginia, Pennsylvania, and the District of Columbia. The principal tributary stream is the Shenandoah River, draining more than 3,000 square miles. The Cacapon River, Conococheague Creek, Monocacy River, and Anacostia River are other tributaries of the Potomac.

The average annual temperature for the sub-basin is about 54° F. with extremes of 30 below and 112 above recorded. The mean annual precipitation is about 38 inches, with annual ranges from 27 to 50 inches during any one year. The average snowfall varies from five inches on the Coastal Plain to 30 inches in the Allegheny Plateau.

Economic Development

There are 13 major cities and more than 120 smaller communities scattered throughout the sub-basin. The largest is the Nation's Capital which, in its metropolitan area, includes over half of the sub-basin's population of 2,300,000.

The mountainous section around the headwaters is sparsely settled; the inhabitants, many of whom were formerly employed in lumbering and mining, now live largely by farming. In central Maryland and the Shenandoah Valley the lands are fertile and highly cultivated. East of the Blue Ridge and south of Washington there are opportunities for additional farming operations with good markets at Baltimore and Washington.

The sub-basin has well-developed recreational areas. In addition to the Shenandoah National Park, portions of the Monongahela National Forest and George Washington National Forest are situated in the sub-basin. Numerous Federal and State parks attract great numbers of visitors annually from all parts of the Nation.

Coal is the important mineral resource. Cumberland is the leading manufacturing center. Among the industrial plants are textile mills, pulp and paper plants, tanneries, and chemical industries.

Uses of Water Resources

The principal water uses in the Potomac River Sub-Basin are for domestic and industrial water supply and recreational purposes. There are recorded a total of 184 developed water supplies for municipal and industrial use in the sub-basin taken from surface streams, springs and drilled wells. Of this number, 87 are surface water supplies, half municipal and half industrial. Municipal surface water supplies range in quantity from 20,000 gallons per day to a maximum of 220,000,000 gallons per day for the District of Columbia. The total water usage from surface streams for industrial and domestic use is about 1.5 billion gallons per day, of which approximately 267 million gallons per day is municipal consumption serving a population of about 1.5 million, and 1.2 billion gallons per day is for industrial use, two-thirds of which is accounted for by power companies which use huge quantities for cooling waters.

Since the combined water demand is occasionally greater than dry weather flows recorded at Great Falls, it is obvious that the water used for municipal and industrial purposes represents in large degree water that has already been used and wasted by upstream municipalities and industrial plants.

The Potomac River is navigable from Georgetown in the District of Columbia where tidal action ceases, to Chesapeake Bay. Shipping is principally to Washington and Alexandria. The River above Washington and its tributaries provide valuable fish producing areas for game and pan fish and many of the streams are used as camping sites and for boating and fishing. The lower Potomac is an excellent waterfowl feeding ground, muskrat producing area, and is noted for its excellent duck shooting. It contains commercial and game fishing areas, oyster beds, and is widely used for boating activities, although suitable areas for bathing purposes are confined to the lower sections of the Potomac.

Pollution Contributed to Water Resources

The Potomac River and its tributaries receive the discharges from 136 municipal sewer systems which serve a population of approximately 1,597,000.

Industrial wastes are discharged directly to the streams from 102 establishments, of which 72 percent produce organic wastes. Twenty-seven establishments produce inorganic wastes and the type of waste discharged from five plants is undetermined.

The two major areas of pollution are on the North Branch between Luke and Cumberland, caused by the discharge of wastes from industries, domestic sewage and acid mine drainage; and the Potomac River and the Anacostia River in the Washington Metropolitan Area, caused by the discharge of sewage and industrial wastes. More than two-thirds of the total municipal pollution in the entire sub-basin is contributed by Washington, D. C. and its environs.

Pollution Prevention Measures in Effect

Sewage treatment facilities are provided for treating the waste waters from 86 municipal sewer systems which serve a population of about 1,400,000, over 87 percent of the estimate of sewered population in the sub-basin. About 70 percent of the sewered population is provided with primary treatment. No treatment facilities are provided by 50 municipalities with 13 percent of the sewered population.

Industrial waste treatment facilities are provided at 53, or one-half of the industrial establishments which are sources of pollution within the Potomac River Sub-Basin. No waste treatment facilities are provided for 32 plants, or 31 percent of the establishments, and the situation at the remaining 17 plants or 17 percent of the establishments is undetermined. Approximately 53 percent of the establishments are related to food and kindred products of which about one-half have waste treatment facilities. Sand and clay mining activities which produce inorganic wastes comprise about 11 percent of the sources of pollution and two-thirds of these have treatment facilities.

Adequacy of Existing Facilities

Approximately 53 percent of the existing municipal sewage treatment plants are of adequate design and are operated in a satisfactory manner; 27 percent are unsatisfactory as to design and operation; and 20 percent are undetermined.

Industrial waste treatment facilities are satisfactory as regards adequacy of capacity in approximately 38 percent of the establishments, unsatisfactory in 34 percent, and undetermined in the remaining 28 percent.

Progress in Pollution Abatement

A few municipal sewage treatment plants were constructed during the 1920's, with real progress during the 1930's with Federal financial assistance. Relatively few plants were constructed throughout the sub-basin

Table A. Sources of pollution*, municipal,
Potomac River Sub-Basin

Municipalities**	Sources of pollution (in number of municipalities)	Population served by sewerage system	Amount of pollution discharged to watercourse (in terms of equivalent number of people)***
Having data on pollution load discharged to watercourse	110	1,557,731	1,111,450
Having population data available (Data on pollution load to watercourse incomplete or not available)	26	39,208	Not applicable
Total	136	1,596,939	—

*The data appearing in this and the subsequent tables for this sub-basin are summations of readily available information. In some cases the data are incomplete. Further, arrangement of data in these tables is difficult because many municipalities have multiple outlets, many of the existing treatment facilities serve several municipalities, and in some cases several treatment plants serve a single municipality. Accordingly, in comparing the tables minor irregularities may become apparent.

In subsequent reports, these inconsistencies will disappear as field investigations are made and the more complete information is obtained.

**Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

***Includes industrial wastes discharged into municipal sewerage systems.

within the years 1946 to 1949 inclusive, when six treatment plants serving a population of about 39,000 were completed, the major installation being the Winchester, Va. sewage treatment works. The District of Columbia constructed additional primary tanks at its Blue Plains plant and has additional improvements under construction, partial installations were also made at Hagerstown and Frederick, Md. Industrial waste treatment facilities were completed at the American Viscose Company at Front Royal, Va.; the Keystone Tanning and Glue Company at Paw Paw, W. Va.; the new plant of the Virginia Woolen Company at Middleway, W. Va.; and other industrial establishments. In addition, many of the industries have changed their processes to reduce pollution and several have waste treatment facilities under construction.

Table B. Sources of pollution, industrial*, Potomac River Sub-Basin

Industries	Sources of pollution (in number of plants)	Amount of pollution discharged to watercourse (in terms of equivalent number of people)
Producing organic wastes	19[a]	429,805
Producing organic wastes	54	Undetermined
Producing inorganic wastes	27	Not applicable
Producing wastes of undetermined type	5	Undetermined
Total	102[b]	--

*Industries having separate outlets and discharging wastes directly to watercourse.

[a] Includes three plants also producing inorganic wastes.

[b] Total adjusted to correct for duplication noted in a.

Pollution Prevention Measures Required

New or improved sewage treatment plants are needed for 62 municipalities to serve a population of approximately 1,382,000; 19 are existing plants which serve 74 percent of the sewered population; while 43 new plants are needed to serve 13 percent of the sewered population. Currently, 54 municipalities with ten percent of the population have adequate sewage treatment facilities. The trend in sewage treatment plant construction, 1910-1950, is indicated on the figure "Growth in Sewage Treatment."

Fifty industrial establishments or 49 percent of the reported sources of industrial wastes require improved or new waste treatment facilities and information is needed to determine the waste treatment status at 35 establishments. Waste treatment facilities are adequate for only 17 establishments or 17 percent of the reported sources of industrial waste pollution.

The estimated cost for the construction of sewage treatment plants and industrial waste treatment works to abate stream pollution in the Potomac River Sub-Basin will range from $40,000,000 to $50,000,000.

Table C. Existing treatment facilities, municipal, Potomac River Sub-Basin

Degree of treatment provided	Number		Population served
	Municipalities*	Plants	
Primary	34	34	1,115,193
Secondary	52	53	272,571
No treatment	50	—	209,175
Total	136	87	1,596,939

*Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

Table D. Existing treatment facilities, industrial*, Potomac River Sub-Basin

Type of industry	Number of plants	Number of industrial plants having:		
		Treatment facilities	No treatment facilities	Undetermined facilities
Food and kindred products..	54	26	23	5
Textile mill products......	5	5	0	0
Paper and allied products..	3	1	1	1
Chemical and allied products......................	2	1	1	0
Rubber products............	1	1	0	0
Leather and leather products......................	5	5	0	0
Miscellaneous..............	20	6	3	11
Mining.....................	12	8	4	0
Total.....................	102	53	32	17

*Industries having separate outlets and discharging wastes directly to watercourse.

Table E. Adequacy of existing treatment facilities, Potomac River Sub-Basin

Existing treatment facilities	Number	Adequacy with relation to:					
		Capacity			Operation		
		Satisfactory	Unsatisfactory	Undetermined	Satisfactory	Unsatisfactory	Undetermined
Municipal	87[a]	46[b]	24[c]	17[d]	47[e]	22[f]	18[g]
Industrial	53	20	18	15	23	15	15

[a] Serve a population of 1,387,764.

[b] Serve a population of 216,893.

[c] Serve a population of 1,111,971.

[d] Serve a population of 58,900.

[e] Serve a population of 1,157,283.

[f] Serve a population of 155,581.

[g] Serve a population of 74,900.

Table F. Progress in pollution abatement, Potomac River Sub-Basin

Year	Municipal		Industrial	
	Plants completed	Design population	Plants completed	Amount of waste treated (in terms of equivalent number of people)
1946	1	300	—	—
1947	—	—	—	—
1948	4	4,360	—	—
1949	1	31,000	—	—

Table G. Requirements for municipal and industrial waste treatment plants*, Potomac River Sub-Basin

Requirements	Municipal		Industrial
	Number	Population served by facilities	Number
New plant	43	203,643	30
Enlargement or additions to existing plant	16	1,084,430	19
Replace existing plant	3	94,200	1
No project required	54	154,724	17
Undetermined	20	59,942	35
Total	136	1,596,939	102

*The needs set forth in this table are based on presently available information. However, future studies and evaluations may result in some changes in these needs.

Table H. Status of treatment works projects to abate pollution, July 1, 1950, Potomac River Sub-Basin

Status of project	Number	
	Municipal	Industrial
No formal action	28	29
Abatement ordered	5	8
Plans under preparation	13	4
Final plans approved	12	5
Construction awaiting financing	2	--
Under construction	1	4
Status undetermined	12	5

Table I. List of Needed Projects, Potomac River Sub-Basin (Chesapeake Bay Basin)

Municipalities and industries needing new or improved treatment facilities are tabulated on the following pages. "Municipalities" in the tabulations includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers, and industries discharging sanitary sewage wastes directly to watercourse.

The list is based upon information readily available pending completion of additional field surveys and investigations by the respective State water pollution control boards. It is admittedly incomplete but is believed to contain most of the significant sources of pollution. Consequently, the requirement "new plant" may upon future investigation indicate connection to city sewers, or other alternate requirements for industries and in some instances for small municipalities or areas contiguous to larger areas having treatment facilities.

Municipalities and industries desiring detailed information on problems affecting them are referred to their State water pollution control agency.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Potomac River Sub-Basin

Name	Population served	Project requirements	Remarks
District of Columbia--Municipal:			
Washington	950,000	Enlargement or addition to existing plant.	Under construction.
Maryland:			
Barton	540	New plant.	Preliminary discussions with Allegany County Sanitary Commission.
Brunswick	1,470	Enlargement or addition to existing plant.	--
Cumberland	45,000	New plant.	Abatement ordered. Estimated Cost: $2,000,000.
Frostburg	5,500	New plant.	--
Hancock	780	New plant.	--
Indian Head	1,000	Enlargement or addition to existing plant.	--
Lonaconing	2,000	New plant.	Preliminary discussions with Allegany Sanitary Commission.
Luke	900	New plant.	Preliminary discussions with Allegany Sanitary Commission.
Maryland State Reformatory for Males, Roxbury	400	Enlargement or addition to existing plant.	Construction awaiting financing. Estimated cost: $200,000.
McCool	400	New plant.	Preliminary discussions with Allegany Sanitary Commission.
Midland	650	New plant.	Preliminary discussion with Allegany Sanitary Commission.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Potomac River Sub-Basin--Continued

Name	Population served	Project requirements	Remarks
Mount Savage	1,800	New plant.	Preliminary discussions with Allegany Sanitary Commission.
Potomac Heights	950	New plant.	Now provides chlorination.
Security	200	New plant.	--
Taneytown	--	New plant.	No central system.
U. S. Naval Model Testing Basin, Carderock	1,200	Enlargement or addition to existing plant.	--
U. S. Navy Powder Factory, Indian Head	500	Enlargement or addition to existing plant.	--
U. S. Navy Reservation, Indian Head	2,100	New plant.	--
Washington Suburban Sanitary District, Bladensburg Plant	81,000	--	Plant to be abandoned and connection made to District of Columbia for treatment.
Westernport	3,500	New plant.	Preliminary discussions with Allegany Sanitary Commission.
Williamsport (Potomac River Plant)	1,300	Enlargement or addition to existing plant.	--
Pennsylvania:			
Gettysburg	5,910	Additions to existing plant.	Plans for secondary treatment approved, construction ordered by 2/15/52. Estimated cost $216,000.
Hyndman	650	New plant.	Plans approved for complete treatment. Estimated cost $118,000
Mercersburg	2,213	New plant.	Plans for complete treatment approved, construction ordered by 3/21/52. Estimated cost $151,000.
Mount Alto Sanitarium	1,550	Additional sludge digestion capacity.	Plans approved.
Virginia:			
Alexandria	75,000	New plant.	Final plans approved 1948, estimated cost $2,200,000.
Arlington Co.	20,000	New plant.	Plan to convey sewage to existing plant location.
Arlington Co.	105,000	Enlargement or addition to existing plant.	Existing plant, plans approved 1947. Estimated cost $2,000,000.
Augusta Military Academy, Fort Defiance	350	New plant.	--
Berryville	1,200	Enlargement or addition to existing plant.	Engineers preliminary report completed. Estimated cost $46,000.
Bridgewater	1,300	New plant.	--
Broadway	450	New plant.	--

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Potomac River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Colonial Beach	2,500	Enlargement or addition to existing plant.	—
Dayton	980	New plant.	Preliminary report completed, estimated cost $50,000.
Edinburg	600	New plant.	Engineers employed.
Elkton	1,500	New plant.	—
Fairfax	1,200	Replace existing plant.	Final plans approved 1947.
Fairfax County Sanitary District No.1	10,000	New plant.	Preliminary plan completed, estimated cost $3,000,000.
Harrisonburg	8,600	Enlargement or addition to existing plant.	Final plans approved 1948; Estimated cost $308,000.
Leesburg	2,000	Enlargement or addition to existing plant.	Engineers employed.
Luray	1,500	New plant.	Preliminary plans completed, estimated cost $50,000.
Monterey	300	New plant.	Preliminary report completed. Estimated cost $25,000.
Mount Jackson	500	New plant.	Plans in preparation.
Mount Vernon	400	New plant.	—
New Market	775	New plant.	Final plans approved. Estimated cost $80,000
Orkney Springs	300	Enlargement or addition to existing plant.	--
Strasburg	1,500	New plant.	Preparing plans.
Timberville	560	New plant.	--
Waynesboro	7,500	New plant.	Final plans approved 1948. Estimated cost $850,000.
Woodstock	1,500	New plant.	Preparing plans.
West Virginia:			
Berkeley Springs	700	New plant.	--
Charlestown	1,500	Enlargement or addition to existing plant.	Final plans approved.
Franklin	200	New plant.	--
Harpers Ferry	250	New plant.	--
Keyser	4,500	New plant.	--
Martinsburg	12,000	Replace existing plant.	Plans in preparation.
Moorefield	950	New plant.	--
Paw Paw	800	New plant.	Plans completed. Construction stopped during war. Awaiting financing.
Petersburg	1,000	New plant.	--
Piedmont	2,400	New plant.	--
Shepherdstown	945	New plant.	--
Maryland--Industrial:			
Buckeystown Canning Co., Buckeystown	--	Enlargement or addition to existing plant.	Cooperating with State Water Pollution Control Commission on chemical treatment plant.

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Potomac River Sub-Basin—Continued

Name	Population served*	Project requirements	Remarks
W. D. Byron & Sons, Inc., Williamsport	--	New plant.	Has settling tank. Cooperating with State Water Pollution Control Commission on chemical treatment plant.
Celanese Corp. of America, Amcelle	--	New plant.	Recovery methods used to reduce original quantity of wastes. Abatement of pollution ordered. Estimated cost $1,000,000.
Central Chemical Co., Hagerstown	--	New plant.	Has settling tank. Abatement of pollution ordered. Estimated cost $5,000.
Cumberland Brewing Co., Cumberland	--	New plant.	--
Essig Poultry Co., Taneytown	--	Enlargement or addition to existing plant.	Has screens.
Hancock Canning Co., Hancock	--	Enlargement or addition to existing plant.	Wastes discharge to lagoon. Abatement of pollution ordered. Estimated cost $5,000.
E. J. Nusbaum Co., Taneytown	--	Enlargement or addition to existing plant.	Has screens.
Queen City Brewing Co., Cumberland	--	New plant.	--
A. H. Smith Sand & Gravel Co. Branchville	--	New plant.	Abatement ordered.
Southern Packing Co., Cavetown	--	New plant.	Cooperation with State Water Pollution Control Commission. Construction of chemical precipitation plant.
Thomas & Co., Adamstown	--	Enlargement or addition to existing plant.	--
Joseph Weller Canning Co., Linwood	--	Replace existing plant.	Solids are collected and deposited on fields.
West Virginia Pulp & Paper Co. Luke	--	New plant.	Stream is acid—recovery methods used to reduce original quantity of wastes. Abatement of pollution ordered. Estimated cost $1,000,000.
Western Maryland Dairy, Detour	--	New plant.	Cooperating with State Water Pollution Control Commission, on waste treatment studies.

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Potomac River Sub-Basin--Continued

Name	Population served*	Project requirements	Remarks
Western Maryland Dairy, New Windsor..................	--	New plant.	--
Western Maryland RR Co., Hagerstown..................	--	New plant.	Oils, grit, caustic solution from washing operations. Treatment facilities under construction. Estimated cost $50,000.
Willow Farms Dairy Co., Frizzelburg.................	--	New plant.	--
Pennsylvania:			
H. J. Heinz Co., Chambersburg................	--	Enlargement or addition to existing plant.	Existing treatment works inadequate. Under orders to abate pollution. Awaiting action by Borough of Chambersburg to admit wastes to municipal sewage treatment works. Borough estimates $40,000 cost of necessary additional facilities.
Lowengart & Co., Franklin County.............	--	Enlargement or addition to existing plant.	Original plans for treatment now inadequate. Abatement ordered. Estimated cost $14,000.
National Fruit Products Co., Chambersburg................	--	Enlargement or addition to existing plant.	Treatment works allowed to deteriorate. Abatement ordered. Estimated cost $10,000.
Virginia:			
Celanese Corp. of America, Verona......................	167	New plant.	Sewage discharge.
Clearbrook Woolen Mills, Clearbrook..................	--	Enlargement or addition to existing plant.	Has vibrating screens.
J. Lynn Cornwall, Inc., Purcellville................	4,300	New plant.	Has catch basin to remove portion of settleable solids. Engineer engaged.
Crompton-Shenandoah Co., Waynesboro..................	--	New plant.	Has settling tank.
Duplan Corp., Grottoes....................	--	New plant.	Sewage treatment plant needed.
Edinburg Poultry Dressing plant..............	--	New plant.	--

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Potomac River Sub-Basin--Continued

Name	Population served *	Project requirements	Remarks
DuPont Rayon, Waynesboro			
Sanitary wastes	2,000	New plant.	Has lagoons for lime sludge. Waste reduced about 50% in process. Reduction to 30% of 1946 load expected by 8/1/50.
Industrial wastes	--		
Jackson Meat Market, Mount Jackson	--	New plant.	--
Luray Textile Corp., Luray	--	New plant.	--
Mayer Brothers Luray	--	New plant.	--
Merck & Co., Elkton	--	New plant.	Under construction.
Mill Creek Cannery, Mount Jackson	--	New plant.	--
Northern Virginia Construction Co.	--	New plant.	Settleable solids and discoloration. Needs settling facilities.
Old Virginia Packing Co., Front Royal	--	New plant.	Solids disposed of on land.
Oscar Webel Hosiery Corp., Verona	--	New plant.	Sewage discharge.
O'Sullivan Rubber Co., Winchester	500	Enlargement or addition to existing plant.	Under construction.
Rockingham Poultry Mktg. Co-op., Broadway	--	New plant.	--
Valley Meat Co., Harrisonburg	--	New plant.	Under construction.
Virginia Canfoods, Inc., Timberville	--	New plant.	--
Virginia Farms, Inc., Verona	--	New plant.	--
Virginia Oak Tannery, Inc., Luray	--	Enlargement or addition to existing plant.	Lagoons with regulated discharge.
West Virginia:			
Halltown Paper Board Co., Halltown	--	Enlargement or addition to existing plant.	Has screens - Plans under preparation.
Keystone Lime & Stone Co., Millville	--	Enlargement or addition to existing plant.	Plans under preparation.
Keystone Tanning & Glue Co., Moorefield	--	Enlargement or addition to existing plant.	--
Keystone Tanning & Glue Co., Paw Paw	--	Enlargement or addition to existing plant.	--
Keystone Tanning & Glue Co., Petersburg	--	Enlargement or addition to existing plant.	--

See reference at end of table.

Table I. Project list - municipalities and industries requiring improvements for abatement of pollution, July 1, 1950, Potomac River Sub-Basin--Continued

Name	Population served *	Project requirements	Remarks
Koppers Co., Green Springs...............	--	New plant.	Plans under preparation.
Penna. Sand Glass Co., Berkeley Springs............	--	Enlargement or addition to existing plant.	Inorganic material.
Standard Lime & Stone Co., Millville..................	--	Enlargement or addition to existing plant.	--

*Strength of industrial waste measured in terms of equivalent number of people.

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